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Volume XXII MAY, 1916 Number 5

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# Surgery, Gynecology and Obstetrics

WITH

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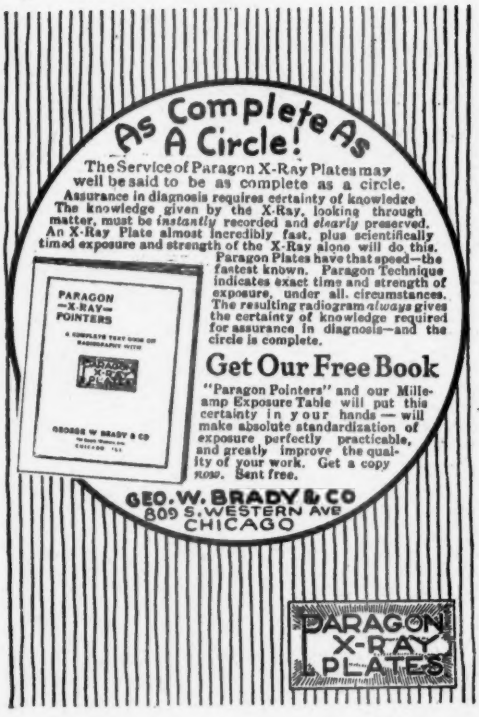
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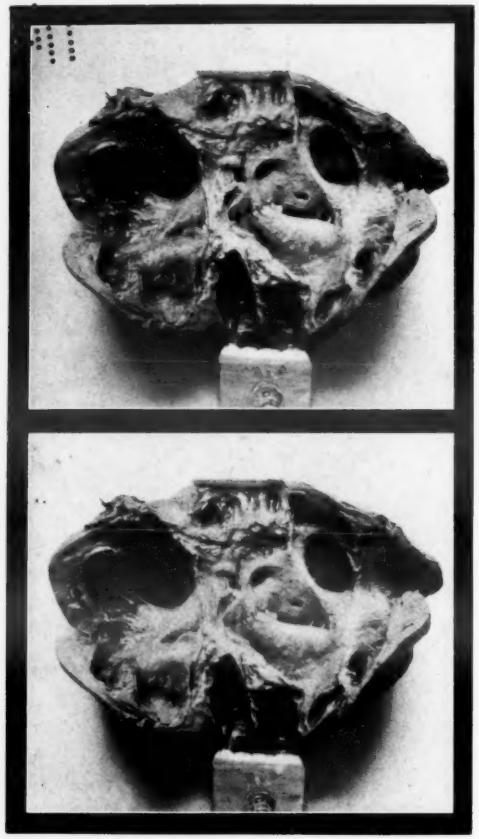

Fig. 18. Specimen of cystic kidney shown in Fig. 17. Note location of cavities.

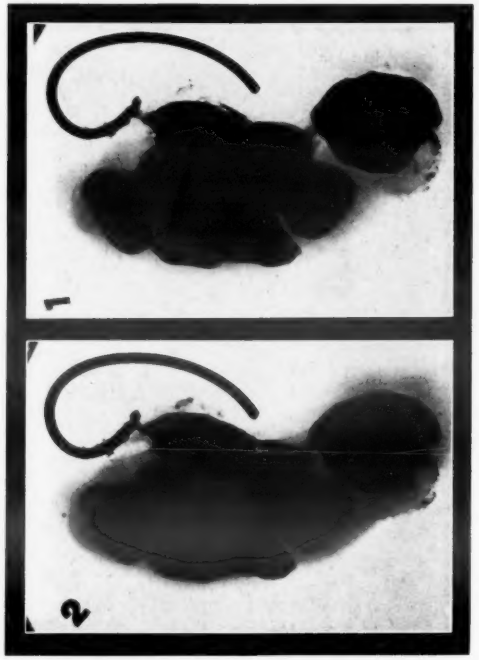


Fig. 17. Cystic kidney injected with bismuth paste. Note relative position of cysts.

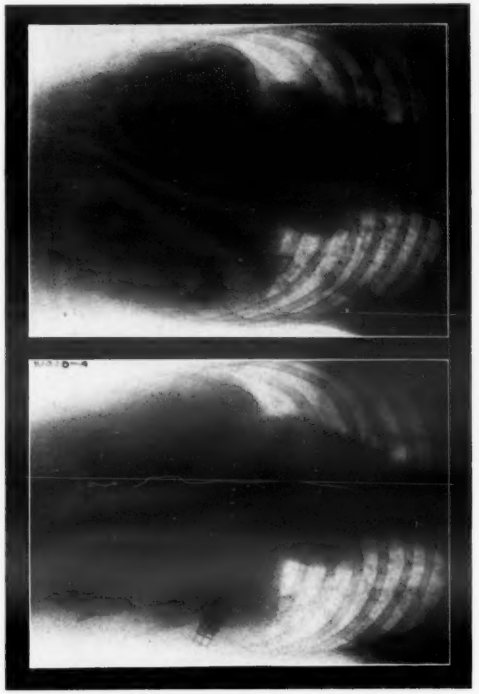

Fig. 9. Bronchial fistula following empyema and bronchial twig injected with bismuth; also perinephritic abscess localized by wire screen.

SURGERY, GYNECOLOGY AND OBSTETRICS

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# A REPORT OF A SERIES OF UNUSUAL FÆCAL AND GENITO-URINARY CASES TREATED WITH BISMUTH PASTE[1]

BY EMIL G. BECK, M.D., F.A.C.S., CHICAGO
Surgeon, North Chicago Hospital

POST-OPERATIVE fæcal and urinary fistulæ as a rule heal spontaneously. Whenever they do not heal, the cases will usually resist all forms of treatment and continue to discharge urine or fæcal matter for months or even years. Such cases are often complicated with suppuration, causing in addition multiple sinuses. The patients are unable to keep themselves clean, often become invalids, and beside their suffering, are a source of worry to relatives and to the surgeon. No wonder they are willing to submit to all sorts of operations which give them the slightest ray of hope for recovery.

I bring this subject now before the profession because of the difficulties in treating such cases, and secondly because my brother, Dr. Carl Beck, and I, during the past eight years have had the opportunity of treating a series of these apparently hopeless cases by means of *bismuth paste* in conjunction with other surgical treatment. Our results have been so satisfactory that we believe we now can offer some suggestions by which these obstinate cases can be cured.

Our series consists of 38 cases, 17 post-operative fæcal fistulæ and 21 cases of the genito-urinary tract. Of the former (fæcal fistulæ), 12 were the simple type following appendectomies, and are not cited here in detail, although they were treated with bismuth paste. The remaining 5 cases of fæcal fistulæ are given in detail because each case teaches some practical point. Of the latter group, 21 cases of sinuses of the genito-urinary tract, all are given in detail and illustrated either by single or *stereoscopic roentgenograms*. They represent a large variety of conditions with which the genito-urinary specialist has had the greatest difficulty and it is hoped that many useful lessons will be learned from reading the histories and treatment employed.

Before citing the cases, I wish to give my present views on the causes, the prevention, and the most efficient treatment of fistulæ of all types, because the fæcal and genito-urinary fistulæ are often combined with chronic suppurative sinuses.

First of all, it must be remembered that a fistula is nothing more than a contracted abscess cavity. An abscess, after being evacuated, will shrivel and leave a long tortuous channel, beginning at the focus of the disease, and frequently will open at a great distance from its original source.

This can be seen in a large number of cases, which I shall illustrate by one case of unusual interest.

CASE 1, F. A man 53 years of age developed what was though to be a pararectal abscess twelve years ago. It was incised and a fistula remained.

[1] Read before the Chicago Surgical Society, December 3, 1915. (For discussion, see p. 629.)

During the next twelve years he had three extensive operations for rectal fistula. The result was an incontinence of fæces. During the past two years he was confined to bed, a helpless invalid.

I saw him in July, 1913, in London, Canada. He had been on a cot for nearly two years. The discharge was so profuse that he had to be dressed three or four times a day in order to preserve a semblance of cleanliness. The rectum was gaping open, so that one could inspect about four inches without a speculum.

A week later he came to Chicago from Canada. I injected the pararectal sinus with bismuth paste and took a radiogram. This revealed that the apparent *rectal fistula originated in the eleventh dorsal vertebra* and caused a large network of sinuses in the abdomen. The radiogram showed clearly that this was a case of tuberculous spondylitis with a psoas abscess opening near the rectum, and not a rectal fistula.

Figure 1 illustrates clearly the origin of the disease, as well as the many branches of the sinuses.

After three months' treatment with injections, the patient left the city with forty pounds gain in weight, and able to walk.

The formation of sinuses usually takes place in this manner: When an abscess is formed, the pus pushes its way in the line of least resistance and undermines the tissues in various directions by its increasing pressure, until it has reached a place near the skin or some hollow organ, where it breaks through and empties its contents. Usually it will run beneath the muscle sheath and fascia, opening at some distance from the original focus. In one of my cases a psoas abscess opened above the clavicle and the sinus was mistaken for a broken down tubercular gland in the neck.

After an abscess has emptied its contents, a shrinkage of the cavity takes place and a network of sinuses remains. This when shown in the radiogram will often cause great surprise as to its dimensions. I illustrate this point in Fig. 2 (a network of sinuses resulting from a hip-joint disease).

At times small abscesses will lock themselves off and will empty their contents into different regions and thus result in multiple openings. I have seen as many as forty openings as a sequence of a knee-joint disease.

Sinuses frequently empty their contents into the bowel or bladder. At the same time the sinuses may have numerous openings through the skin and may discharge fæcal matter, urine, or both. I cite several such cases in this report.

The second point I wish to make is that most sinuses are due to secondary infection of cold abscesses. *Secondary infections can be prevented by injection of a 5 or 10 per cent bismuth paste*, immediately after incision of the cold abscess. In a series of over 200 cases, treated by me, I have been able to prevent secondary infection in 98 per cent; only 4 of the entire series had a fistula.

If, however, a sinus remains, owing to secondary infection, through the fault of either the patient or physician, then we possess means of treatment, which I have shown to be successful in at least 65 per cent of cases of all types, and usually without any radical surgery; namely, by the injection of *bismuth paste*. The percentage of results are not taken from my own clinic, but from the average obtained by all surgeons throughout the world. They refer to the usual run of cases, such as hip-joint disease, spondylitis, etc., without such complications as urinary fistulæ or fæcal fistulæ.

In cases where abscesses open into the bladder or the rectum, the same process of their origin holds true. This fact is contrary to the opinions of some that a fistula burrows its channel through the tissues from an ulcerative focus to the point of exit. In cases in which a urinary fistula is complicated by a discharge of pus, the results have been very satisfactory. As the suppurative sinuses yield to the injections, a tendency for closure against the urinary leakage is also accomplished. Cases of non-suppurative urinary fistulæ, which have no natural tendency for closure, do not yield so readily to the bismuth treatment. For some reason the constant discharge of urine through the fistula renders the walls unfavorable to cicatrization. Such cases require either the actual cautery or strong caustics, and in some cases surgical intervention.

Since I am to confine my remarks to cases complicated with fæcal or urinary fistulæ, I shall show what can be accomplished in these cases by comparatively simple means; but before citing cases, I wish to say a few words on the technique, which is most essential to obtain good results.

TECHNIQUE

The method, as I have already described in previous publications, consists of injecting a quantity of bismuth paste (*liquefied by heating in a water bath*), with a glass or metal syringe, into a sinus until one feels reasonably certain that all ramifications have been filled. The paste, thus injected, will rapidly thicken and remain in the sinuses long enough to enable us to take a radiogram. Such radiogram will show us a true picture of the hidden labyrinth of channels and will often lead us to the focus from which the disease originally started. In many instances it will reveal errors in our previous diagnosis and consequently change our treatment.

It will require but little persuasion to convince even the most skeptical of the diagnostic value of this method. A perusal of only a few cases cited in this paper will teach us its advantages. We will recall instances in which such a radiogram would have been of great assistance and might have spared many a useless operation.

Formerly, we relied upon the probe or the injection of colored fluids as pathfinders of sinuses, but these only served as guides during the operation, while with this method we are able to make a more correct anatomical diagnosis before an operation is decided upon, and thus discriminate between operable and non-operable cases. If an operation is necessary, the procedure can be carried out with greater thoroughness and precision, as we have definite plans before us.

When the sinuses are very long and tortuous, the paste should be injected *in a liquid state*, so that it will flow readily into every part of the sinus tract. If there is more than one opening, the paste is likely to escape from the nearest opening and thus miss the remaining channels. To avoid this technical error, the mouths of all the other sinuses should be compressed by an assistant placing the finger-tip against it, so that the liquid will follow its course in other directions, filling up the path of the sinuses. *It is essential that every crevice should be filled at one injection*, otherwise there will be a recurrence of suppuration.

Great care should be taken not to inject too large a quantity into large pus pockets and

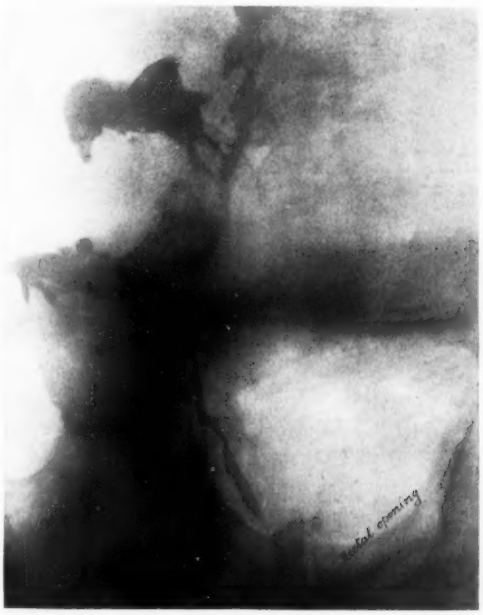

Fig. 1. Supposed rectal fistula, which proved to be an abscess resulting from tuberculosis of eleventh dorsal vertebra.

allow it to remain for too long a time, because of the possibility of absorption of bismuth, which is likely to produce bismuth intoxication and even fatal poisoning. This complication can easily be prevented. In the North Chicago Hospital we were fortunate in not having a single fatal case in our series of 1800 cases. However, I observed a case of very early bismuth poisoning in an empyema during the early period of this treatment, but I was able to check additional absorption and save the patient. This case was reported in the *Journal of the American Medical Association*, January 8, 1909, and is the first case on record. I warned the profession against the indiscriminate use of the paste. It is fortunate that most of these accidents were at once reported in the literature. This has put on guard those who thought that bismuth was an entirely harmless substance. My publication and the reports of others who were unfortunate enough to have this complication, must have had a very good effect, because nearly all the cases of poisoning re-

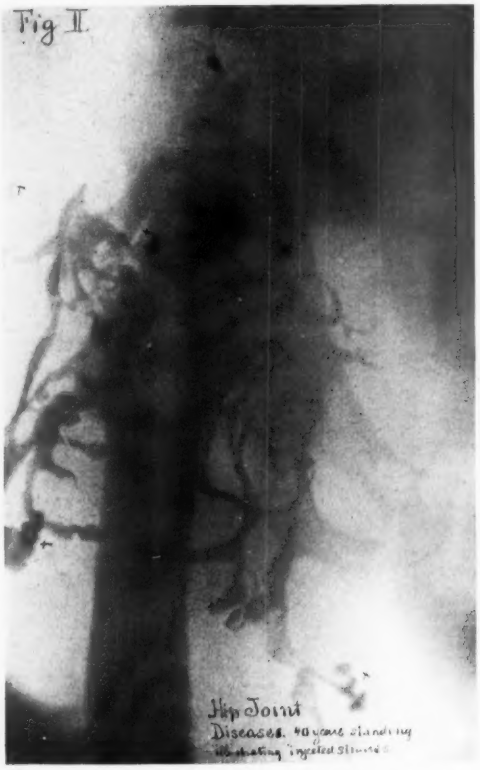


Fig. 2. Network of sinuses resulting from hip-joint disease.

ported occurred in the first two years, 1908 and 1909, and none appeared in the literature in the past year, although the bismuth treatment is now employed more extensively than before.

It is gratifying to know that the poisoning can be prevented, and if it accidentally occurs and is discovered in time, it can be checked before it causes irreparable damage.

### PREVENTION OF BISMUTH POISONING

The prevention consists in not allowing large quantities of the paste to remain in the body for too long a period of time on account of its gradual absorption.

Should the symptoms appear, the paste must be removed by washing out the cavity with *warm olive oil*. The sterile oil should be injected and retained from twelve to twenty-four hours, in order to produce an emulsion with the bismuth mixture. This emulsion should be withdrawn by means of a catheter or suction syringe. After its removal all symptoms will promptly disappear. Scraping out the paste with a scoop is a dangerous procedure, because it opens new channels for absorption.

### FÆCAL FISTULÆ

In fæcal fistulæ we should use the paste of a thicker consistency, so that it will not run into the bowel but will fill out the usually wide channel and prevent the escape of fæcal matter. The consistency of the paste is regulated by heating the mixture. In wide gaping fistulæ it can be used without heating.

It is well known that as a rule the post-operative fæcal fistulæ have a tendency to spontaneous closure, especially those of the large bowel. The fistulæ from the small intestine are more serious and more difficult to heal. If the mucous membrane of the bowel protrudes above the skin, the bismuth paste is not applicable. If, however, a fæcal fistula is deep and communicates with the exterior through a long channel, the injection will be of great service. When the fæcal fistula undermines the tissues before it reaches the external opening and a large area or sac is constantly filled with fæcal matter, the bismuth paste is indicated.

It is a fortunate circumstance that precisely in those cases where operations are very difficult or impossible, the paste is of excellent service, while in those cases favorable for operation, the paste is of comparatively little value.

I am often asked what is the modus operandi which brings about this rapid closure of the sinuses and fistulæ? I believe it is due to a sterile medication brought in contact with the walls of the sinus or pocket, instead of having them soiled constantly with fæcal matter. This cleansing process permits healthy granulations to form, which gradually obliterate the space previously filled with fæcal matter.

If the technique is properly applied, and all recesses are filled, the fæcal matter will begin

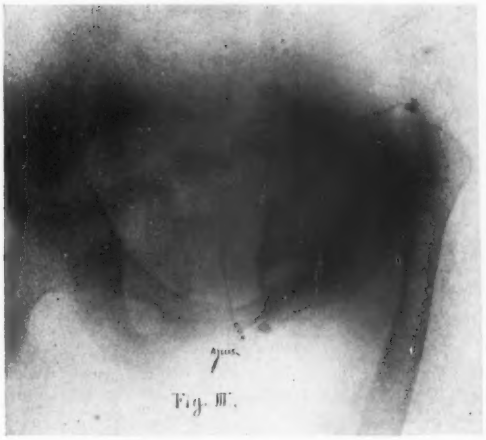


Fig. 3. Rectal and fæcal fistulæ originating from hip-joint disease; left ischium absent.

Fig. 4. Fæcal fistula following appendicitis, undermining muscles.

to pass through its natural channel and the fistula will gradually close; at least, this has been my experience.

It is customary with us when a fæcal fistula follows an operation to wait at least two weeks for spontaneous closure. By this time if the fistula has not entirely closed, it is usually narrowed down to small caliber and then the injections are instituted at intervals of one or two days. Just enough paste is injected to fill the sinus without an excess into the bowel. No attempt is made to pack the sinus with gauze, but merely an external dressing is placed over the wound. There is no irrigation necessary before the injection. In fact it is contra-indicated.

Following the above rules of treatment, we were not obliged to resort to secondary operations, as the cases have either healed spontaneously or have closed subsequent to injections of bismuth paste.

I shall now cite in detail five more cases of fæcal fistulæ, since each of them teaches some practical point in the diagnosis and treatment of this class of cases.

CASE 2, F. Post-operative fæcal evacuation through abdominal incision, closure following bismuth injections.

Mrs. Rose J., age 36, married 20 years, no children; suffering from pyosalpinx for many years and run down in general health. Operated on by Dr. Carl Beck, July 19, 1909. The bowel was firmly adherent to the tube and was torn in several places. Resection of the bowel at that time was impossible.

For the following five months all the fæcal matter was expelled through the abdominal incision, none passing through the rectum. December 14, 1909, she returned to the hospital for resection of the bowel but owing to an accident to her husband the operation was postponed. The patient was emaciated, weighing only 98 pounds, and a poor risk for operation.

At this time I began applying bismuth paste in fæcal fistulæ, and tried it in her case, injecting first very large quantities into the bowel, through the abdominal wound, which was wide open and still discharging all the fæcal contents of the bowel. To my surprise the wound began to contract and within three weeks narrowed to a pinhead opening, through which only gas escaped, the contents of the bowel now passing through the rectum.

The patient began to recuperate, gaining 50 pounds in the first three months after this treatment was instituted, and her present weight is 189 pounds. (The patient exhibited before the Chicago Surgical Society shows the wound is closed; there has been no reopening in the past five years, she feels perfectly well and is able to work in spite of the hernia.)

*Points of interest.* Closure of large opening in the bowel without surgical interference. Unusual gain in weight.

CASE 3, F. Fæcal fistulæ, following resection of bowel; bismuth treatment; closure.

F. E., age 50, physician. Operated upon by Dr. Carl Beck, on May 5, 1914, for removal of the lower part of the sigmoid, on account of a total obstruc-

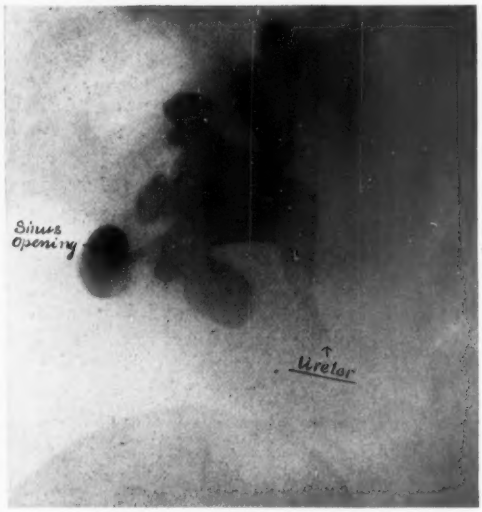


Fig. 5. Injected pus cavity of kidney with strictured ureter.

tion of that part of the bowel, due to a solid growth. On account of the situation of the tumor an anastomosis could not be made at once and a colostomy was performed.

In July a second operation to establish the normal action of the bowel was performed, which left fæcal fistulæ which had no tendency to close and continued to discharge in three different places in the region of the incision.

This kept on until the latter part of November, 1914, when I injected bismuth paste for a period of five weeks, at intervals of two or three days. All three fæcal fistulæ closed and there was no recurrence up to this date.

The patient's general condition is first rate.

*Points of interest.* Three fæcal fistulæ injected through one opening. Closure in five weeks.

CASE 4, F. Hip-joint disease causing pararectal abscess and fæcal fistulæ; twenty years suppuration; closing of fæcal and suppurative fistulæ with bismuth injections.

Mr. C. T. H., age 30, had right hip-joint disease since childhood. In 1893 he was operated on and the necrosed head of the femur removed. Several sinuses leading to the hip-joint remained, which kept on discharging for the past 20 years and required dressing twice a day. His general health was naturally very much deteriorated.

In January, 1913, he felt a swelling in the perineum and pain in the rectum. On account of high temperature and much pain I opened this abscess outside of the anus and a large amount of pus was evacuated. Inserting my finger into the cavity, small speculæ of bone were removed.

I noted that this cavity communicated with the bowel higher up and discharged a large amount of malodorous pus mixed with fæcal matter. This fæcal mixture kept discharging for weeks, so that a semblance of cleanliness could not be maintained.

Bismuth injections were begun and the closure of the fæcal, as well as the suppurative rectal channels, was accomplished in a remarkably short time. He gradually improved in general health but all the sinuses did not close. Injections were repeated at intervals of a month, and small spiculæ of bone extruded themselves from time to time. At present he reports that only one sinus near the hip is open, discharging only a few drops of serous material, and that he is able to work on the farm.

Figure 3 illustrates injected sinuses.

*Points of interest.* (A) Radical surgical interference in such a case is strictly contra-indicated. (B) Small sequestra are frequently the cause of continued suppuration. (C) Hip-joint disease may at times cause pararectal abscesses and may be mistaken for a rectal fistula.

CASE 5, F. Post-operative fæcal fistulæ six months. Closure after first injection of bismuth.

C. A. F., age 21. At fourteen had a typical attack of appendicitis and a recurrence six years later. On January 31, 1909, he was operated on by his physician, who found a gangrenous appendix, and part of the cæcum had to be resected; drainage for seven weeks, then closure. A week later the wound reopened and fæcal matter kept discharging until July 1909 (six months), at which time he came to me.

An injection of bismuth paste made in July resulted in complete and permanent closure of the fæcal fistula within one week after the injection. It is closed to the present time.

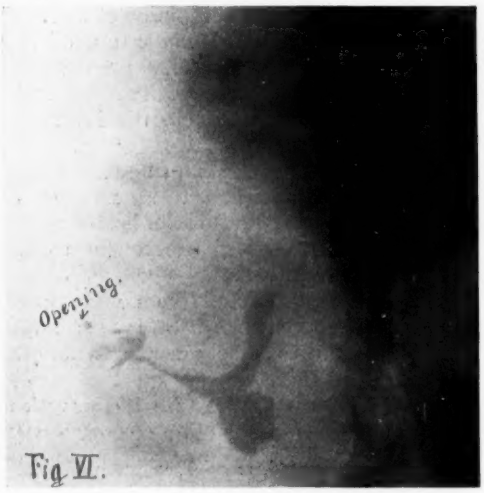


Fig. 6. Post-operative sinus following nephrectomy injected with bismuth.

*Point of interest.* When fæcal matter is prevented from filling the channel, if only for a few days, the chances for closure are greatly facilitated.

CASE 6, F. Fæcal fistula ten months; bismuth injection; closure.

M. A., age 25, family history negative. In the fall of 1905 she was operated on for gangrenous appendicitis. A fæcal fistula resulted and presisted for four months. A second operation failed to close the fistula. It was then treated for six months with silver nitrate cauterization, without improvement. In August, 1906, we took a radiogram after an injection of bismuth paste. It demonstrated the uselessness of our silver nitrate treatment because of the existence of a cavity which undermined the muscles for an area of two inches in diameter (Fig. 4). The first injection was sufficient to obliterate this fistula. Six years later the fistula closed. (Case reported in *Journal of the American Medical Association*, 1909.)

*Comment.* The second operation could probably have been spared had the bismuth injection been used.

### GENITO-URINARY FISTULÆ

Fistulæ of the genito-urinary tract originate in two ways. More frequently they occur after operations or injuries of either the bladder, the ureters, or the kidneys. Less frequently they originate from some disease in the neighboring organs, causing perforation into the bladder, with the escape of urine through one or more sinuses instead of the natural channel.

Fig. 7. Gonorrhœal pyonephrosis; nephrectomy followed by sinus; bismuth injection; closure.

Fig. 8. Perinephritis and multiple abscesses in the back, treated with bismuth paste; closure. Later complication, malarial fever; fatal termination.

These sinuses may discharge either clear urine, pus, or urine mixed with pus. We know, for instance, how frequently after the removal of a tuberculous kidney a sinus persists in discharging pus for months or even years. Again, post-operative fistulæ may result after prostatectomy, and such fistulæ will discharge urine and pus for an indefinite period.

I shall cite one case where urine discharged through sinuses around the hip. This condition was the result of a hip-joint disease, which had extended into the region of the bladder and perforated the same, so that all the urine escaped through the suppurative sinuses around the hips, instead of through the natural channel.

The most favorable genito-urinary cases for treatment by injections of bismuth paste are the cases in which a suppurative sinus has persisted after a nephrectomy. All cases of this type which came under my care during

the past eight years have yielded readily to this treatment. Besides my own series I have on record many such cases reported to me by other surgeons, but these are not included in my report. One of the cases reported is especially gratifying. It is that of a General of the U. S. Army who had a suppurative sinus of fifteen years' duration, following the removal of the kidney. He had had three operations by the most competent surgeons in this country, but suppuration persisted. In the fall of 1910 he went to Rochester, Minnesota, for another operation, and instead of operating, Dr. Mayo directed that bismuth be injected. After two injections the sinus closed and has remained closed to the present time. I have a report from the General concerning his case.

The literature contains a report in 1910 by Heitz, Boyer and Morens.[1] They treated at one time eleven patients with sinuses following old nephrectomies. The result of these eleven most refractory suppurative cases injected with bismuth paste was as follows: Eight healed promptly; one relatively; two were still under treatment, with improvement. The results were accomplished in a very short period of time.

The rules of technique in applying the paste in genito-urinary cases is practically the same as that described under fæcal fistulæ.

I am citing a series of twenty-one genito-urinary cases, to elucidate the different points of treatment:

CASE 1, G. U. Pyonephrosis nephrectomy; drainage ten years; bismuth injections; closure.

Mr. M. E. D., age 54, ten years ago had a large abscess of the left kidney, which was opened and drained, but continued to discharge pus profusely. There was constant pain and poor health during this period.

In August, 1912, examination and radiogram (with injection of bismuth into the pelvis) proved that there was an obstruction in the ureter (Fig. 5).

A radical operation was performed August 19, 1912, by Dr. Carl Beck, and with great difficulty the adherent mass of suppurating kidney was removed and the large cavity packed with gauze. The pedicle was secured with clamps for three days. A week later the gauze was removed and the cavity injected with bismuth paste at intervals of three or four days. The cavity gradually contracted and closed.

[1] Heitz, Boyer and Morens. Des injections de pate bismuthee en chirurgie urinarie. Ann. d. mal. d. org. genito-urin., 1910, June 1.

In November, 1912, the patient returned stating that he was taken suddenly with a pulsating pain in the region of the fascia lata. This lasted a week; the pain then shifted into the left inguinal region, causing pain when the thigh was flexed upon the abdomen. The wound re-opened and bismuth was injected. A radiogram shows a very narrow fistula leading into the bed of the kidney region. The sinus closed and remained so up to date, the patient having fully recovered his health and weight.

CASE 2, G. U. Sinus following nephrectomy for tuberculous kidney; bismuth injections; closure.

Mrs. R., age 28. The patient had all the symptoms pointing to tuberculosis of the kidney and bladder for two years; emaciated to 80 pounds. Urination and pain almost constant.

Nephrectomy was performed in January, 1907, by Dr. Carl Beck, but the ureter was not removed, as it was infiltrated and tuberculous all the way through into the bladder.

A sinus persisted for three months, discharging pus, which had caused a large eczematous area about the wound. After repeated injections the sinus closed and patient began to gain in weight rapidly until now, eight years later, she weighs 178 pounds, a gain of 98 pounds, and she is in perfect health.

*Comment.* Aside from the lesson of the usefulness of the paste in post-operative fistulæ after nephrectomies, we learn another lesson from this case. The patient was emaciated to what is termed by the laity "skin and bones" as a result of a coexisting tuberculous disease of the kidney. She had tuberculosis of the bladder and probably of other organs in the body. After removal of the kidney there was an immediate and constant increase in weight and a change in her general health, increase in appetite, a change in her skin from a cold, clammy, cyanotic condition to a warm and healthy condition, indicating that with the removal of the kidney a complete change had taken place in the nutritive and recuperative powers of the body. Furthermore, the bladder which had been contracted by tubercular ulcerations to a very small size, holding not more than one ounce of urine, began to hold larger quantities each day, without any local treatment. All symptoms of bladder trouble disappeared.

What is the explanation? I quote from my monograph on "Bismuth Paste":

"Is it not possible that through the removal of a large portion of the diseased tissue, our body, which has acquired such high degree of immunity during the gradual development of the disease, is suddenly

Fig. 25. Demonstrates a fair stream of urine six years after operation.

Fig. 22. Urinary sinuses injected with bismuth paste. Origin in the prostate.

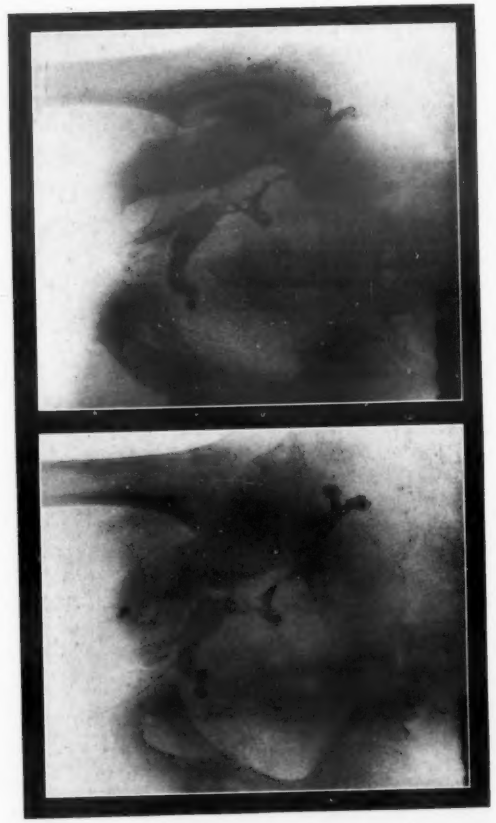

Fig. 19. Abscess cavity in front of bladder and rectal fistula, both originating from hip-joint disease. Note relative position of sinuses.

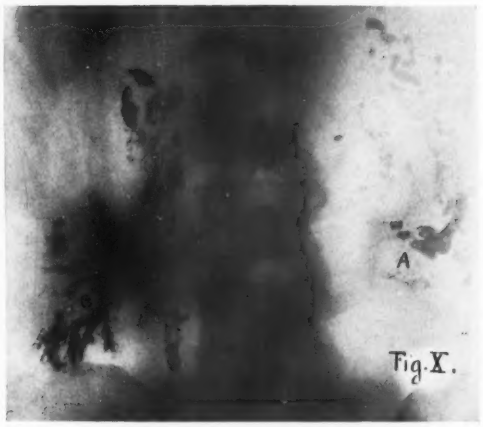


Fig. 10. Network of sinuses in a bilateral perinephritic abscess.

relieved of the source of a large quantity of toxins, and the existing high degree of immunity is powerful enough to cope with the balance of micro-organisms still operating in other parts of the body? In other words, is it not likely that during the development of the disease the degree of immunity keeps pace with the progress of the disease, and that the sudden removal of a part of the diseased tissue leaves the system a sufficient degree of immunity to combat the remaining quantity of disease in the body?"

CASE 3, G. U. Sinus following removal of tuberculous kidney through peritoneal route; bismuth injection; closure.

Miss R. F., age 23, family history negative. Illness began May, 1912, with frequent urination, without pain, no temperature, or loss of weight. In July she had chills, temperature up to 102, blood in the urine, and loss of weight, indicating serious trouble.

A diagnosis of tuberculous kidney was made and on August 17, 1912, a nephrectomy of the right kidney through the abdominal route was performed by Dr. Carl Beck. This permitted the examination of the other kidney, which was normal, but the right proved to be tuberculous and secondarily infected with abscess formation. The ureter was tuberculous but was not resected, It was ligated off with strong silk, the ends of ligature were left outside of the incision and drainage established.

A great deal of pus kept discharging without a tendency to decrease until March 8, 1913 (seven months) and daily temperature persisted. The sinus was injected with bismuth paste, March 8, and ten days later the wound was entirely closed and the extensive eczema disappeared.

The patient recuperated with great rapidity, gained 27 pounds, and is in perfect health.

*Point of interest.* The constant temperature persisting for months disappeared with the first injection.

Fig. 11. Pyonephrosis. Pus pockets of kidney injected through lumbar sinus, showing the filling of same and the passage of the bismuth into the bladder. The sinus closed, and pus disappeared from the urine after ten injections.

CASE 4, G. U. Post-operative sinus following nephrectomy, discharging seven months; injection; closure.

Miss M., servant, age 30, gives history of having had a nephrectomy in the fall of 1907, which left a suppurating sinus.

March 8, 1908, I injected the sinus with bismuth paste, which shows a small cavity in the old kidney bed and an extension of the sinus running upward beneath the twelfth rib (see Fig. 6).

Another injection was made a few days later and the sinus closed. One year later it was still closed. Since then I have lost track of her.

CASE 5, G. U. Gonorrhœal pyonephroses; nephrectomy followed by sinus; bismuth injection; closure.

Mr. J. S., age 27, cutter, consulted Dr. Carl Beck September 27, 1908. Complains of pain in left kidney for one year. Denies specific history but had chronic gonorrhœa for past four years. All symptoms pointed to stone in the kidney but radiogram was negative.

October 3, 1908, the kidney was exposed. Large and congested. It was incised and no stone found, but the kidney could not be entirely removed from its bed on account of infiltration. It was partly broken down during manipulation, with consider-

Fig. 12. Tuberculosis of kidney, sinus treated without nephrectomy; cure.

Fig. 13 (at left). Patient weighed 68 pounds in September, 1908.

Fig. 14. Present weight 148 pounds, two years later.

able bleeding, and the portions removed showed complete degeneration. Without removing the entire kidney the cavity was packed tightly. The temperature rose to 104° and after a few days a large amount of pus and urine escaped from the wound. Since then he passed a large amount of pus in his urine. Gonorrhœal germs were found in the pus.

Twenty days after the operation the temperature was normal and remained so, but the sinus kept suppurating profusely.

On January 25, 1909, about three and a half months after the operation, the first injection was made (see Fig. 7). The pus discharge ceased in a few days and within two weeks the sinuses closed and remained so up to date.

*Comment.* Bismuth paste was effective in gonorrhœal infection of the kidney.

Case 6, G. U. Perinephritic abscess; fistula injected with bismuth paste.

Mr. M., age 31, farmer, family history negative. Had typhoid fever and three attacks of appendicitis.

In October, 1908, he began to complain of pain in the back and had daily temperature of 101°. In December of the same year he was operated on for appendicitis. The appendix was fibrous and an abscess was found about the right kidney. It was opened and drained through the back. The wound continued to discharge pus.

Six months later I examined him again; found two fistulæ discharging pus. Cultures show staphylococci. Radiogram indicates a sinus leading into the kidney. Six injections at intervals of two days were given. Discharge diminished. By July 24, 1909, both sinuses were closed; no pain or fever was noted.

In 1913 the patient writes that he is not entirely well but did not state whether sinuses reopened.

Case 7, G. U. Perinephritic and multiple abscesses, treated with bismuth paste; closure. Later, malarial fever; fatal termination.

Mr. M. F., age 26, lawyer. At 22 had an attack of pleurisy, followed by (what was thought to be) a subphrenic abscess. Diagnosis being uncertain, operation was postponed. Two months later an abscess was opened between the liver and lung. This kept draining but he recuperated and attended college for a year (1912). In June, 1913, he was operated on in Memphis, for the sinus. Although this operation was extensive, the suppuration persisted. He was then sent to Fort Collins, Colorado, where he gradually improved in general health.

Another abscess formed in the region of the right kidney, about four inches lower than the sinus. This abscess was opened and drained and also continued to discharge. Bismuth treatments were instituted in Colorado and the discharge decreased considerably. September, 1914, another abscess formed on the opposite side, in the region of the left kidney. An operation was performed in Colorado, which resulted in a third sinus.

I first saw the patient in November, 1914. The three sinuses were injected and radiogram (Fig. 8) shows a perinephritic abscess on the right side, which stereoscopically viewed shows that the entire kidney was surrounded by a network of suppurative channels. There were numerous sinuses along the spinal column but the vertebræ did not show any signs of disease. The injection on the left side in the kidney region indicated that here too the ab-

scess was perinephritic. Two more abscesses developed during the early part of 1915, one originating in a tubercular rib on the left side in the back and the other from a tubercular rib in front. These were incised and treated with bismuth, and closed within a week or ten days. The remaining sinuses closed and the young man improved gradually in health, so that he left for his home in Mississippi.

After remaining one month in his home town (a hotbed of malarial fever) he suddenly developed paroxysms of chills and high fever, and returned to Chicago in a deplorable condition.

After a thorough examination no retention of pus could be found anywhere and all sinuses were closed. The patient was put on large doses of quinine, which seemed to control the chills and temperature to some extent. At first no malarial organisms could be found in the blood, but later these were discovered. The temperature kept on daily from 101° to 104° for three weeks. By this time he had become very much emaciated, deeply jaundiced and the liver enormously enlarged. Consultations were held and Dr. W. A. Evans confirmed the diagnosis of malarial fever with liver abscess.

On September 6, he expectorated about a pint of pus, the temperature remained around 97° until the next day, when he expired with symptoms of asphyxiation. Post-mortem was not permitted. Cause of death was pronounced to be malarial fever, with secondary abscess in the liver, rupturing into the bronchus.

CASE 8. Lung abscess and bilateral perinephritic abscesses following submucous resection.

C. C., age 23, August 15, 1914, had a submucous resection in Ogden, Utah, with great loss of blood. Two weeks later he had a severe pain in his right chest and for the next three weeks he was confined to bed with fever but no cough. In October, 1914, an abscess formed below the scapula which ruptured spontaneously and kept discharging pus until May, 1915, when he was taken to Salt Lake City for treatment. Two ribs were resected and better drainage established. A month later an abscess formed in the region of the right kidney, which was opened and drained.

In September 1915 he came to me for treatment. I found the patient very much emaciated; one sinus draining from the right lung, another from the right kidney. There was a bulging abscess in the region of the left kidney, distinctly fluctuating.

A bismuth paste injection of the fistula in the chest proved that the abscess in the lung communicated with a bronchus. This is clearly seen in the stereoroentgenogram Fig. 9. It shows the right bronchus filled with bismuth and also a twig of bronchioles in which the bismuth was forced during a coughing spell. There was more positive proof than the radiogram that the communication with the bronchus existed; the patient expectorated some of the paste immediately after it was injected.

In this radiogram we also notice the injection of the bismuth paste in the right nephritic abscess.

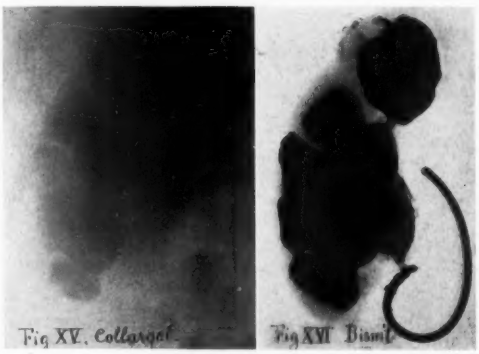


Fig. 15. Collargol injection into cystic kidney, before operation.

Fig. 16. Bismuth injection into cystic kidney after its removal.

To estimate its depth, I have placed a small wire screen on the skin as a land-mark, and it is very instructive to study this stereoroentgenogram from this point of view.

The abscess in the left kidney region was opened, injected with bismuth paste, and shows a multilocular abscess of great extent (Fig. 10). Unfortunately this abscess was already infected, so that it could not be classed among the cold abscesses and treated accordingly.

Here we have a complicate case, a lung abscess with bronchial fistula and double perinephritic abscess.

The injections were kept up for six weeks; the discharge diminished and the patient gradually improved. The sinus in the chest closed, but I decided to send him for the winter to the mountains in Wyoming, where his physician continues the injection of bismuth with the climatic advantages and sunlight treatment.

The latest report I have from his physician is that he has gained two pounds in weight and the sinuses are discharging less.

CASE 9, G. U. Pyonephrosis, draining four years, sinus and abscesses injected with bismuth paste, closure without nephrectomy.

Mrs. N. G., age 45, married, two children, both living. In 1905 the patient had bladder trouble, frequent urinations, pains radiating to the inner side of the thigh, no hæmaturia. This persisted for years.

In July, 1909, she had chills, fever, pain, and swelling in the left loin. She was operated on August, 30, by her physician for abscess of the kidney and a cupful of pus was removed and a drainage tube inserted. She had cough and night sweats thereafter. Since then she has had an offensive and profuse discharge from the sinus of the kidney and pus in the urine.

In November, 1913, my examination revealed a tumor the size of the head of a newborn child in

Fig. 20. Paravesicular sinus and rectal fistula, originating from hip-joint disease. Single radiogram deceptive.

the region of the left kidney, painful on pressure. A stereoscopic radiogram after injection of bismuth paste gave a most interesting finding (Fig. 11).

The injections were repeated at intervals of two weeks for six months. The patient gained in weight (40 pounds), the tumor has reduced to nearly the normal kidney size and the sinus has remained closed up to the present. The urine is free from pus and albumin and she is entirely well.

(The patient was demonstrated at the Chicago Surgical Society.)

CASE 10, G. U. Tuberculosis of kidney, without nephrectomy; bismuth injections; closure.

Miss N. C., age 26, was well until 1907, when she fell from a buggy and slightly hurt her back. After two months of fever, pain in the back, and emaciation, an abscess formed in the lumbar region. The abscess was opened, whereupon secondary infection took place. For one year she was confined to bed, running a daily temperature of one to three degrees, and was reduced to a mere skeleton, weighing only 76 pounds.

July 16, 1908, she was brought to me. In the eczematous lumbar region there were two sinuses, secreting quantities of greenish pus. These two sinuses communicated, as proved by the bismuth injections. On account of the painful condition I could inject only small quantities of the paste. A radiogram proved that this case was tuberculosis of the kidney, the vertebral column being perfectly normal.

Between July 15 and September 9, the sinuses were injected sixteen times without the slightest benefit. The fever continued. On September 9, I used a little more force than usual during the injection and felt as if something had given way. I could then inject three times the usual quantity.

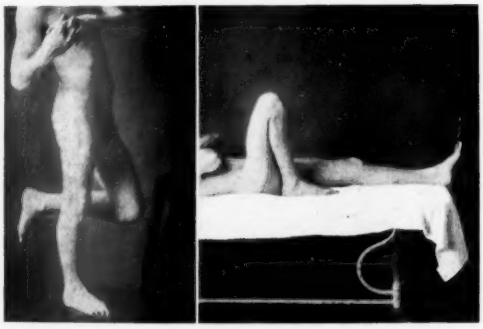

Fig. 21. A and B exhibits patient supporting his weight on the healed out tuberculous hip. Flexion and extension.

Another radiogram after this injection (Fig. 12) plainly shows that the paste reached the kidney. After this injection the temperature fell to normal, the secretion changed to a serous consistency. After five subsequent injections the sinuses were entirely closed. The patient could be taken into the fresh air in a rolling chair and began to gain rapidly. Figure 13 shows her one week after closure of sinuses, when her weight was only 68 pounds. Within one year her weight was 120 pounds, and she is now in perfect health, which can be discerned by her present photograph Fig. 14. Her present weight is 148 pounds.

CASE 11, G. U. Large cystic kidney, nephrectomy; bismuth injections; closure.

Miss H. R., age 17, occupation switchboard operator. Fell twelve years ago, and broke her leg. Since childhood she has "wet the bed." Present complaint: Every two or three weeks has pain in her left side in region of the kidney. It recurs regularly, lasting two or three days. It radiates toward the epigastrium (menstruation regular and normal). Urinary examination: cloudy, acid, 1,020, no albumin or sugar, pus one plus.

Cystoscopic examination December 19, 1914, shows a normal bladder, functionating right kidney, but no urine could be seen coming from the left orifice, although it appears normal.

Pyelography at this time shows a normal right side and a dilated, atonic ureter on the left side. The pelvis of the kidney did not show, nor the calices on the left side.

On January 6, 1915, it was possible to introduce a catheter sufficiently high so that 230 ccm. of collargol fluid was injected. Phenolsulphonephthalein test at this time showed from the right side 95 per cent, appearing in three minutes; from the left side 5 per cent, which appeared in six minutes. Knowing that this left kidney would have to be removed very shortly, 60 ccm. of collargol was injected. Radiogram (Fig. 15) gives a clear picture of the pathological condition present; namely, a group of multiple cysts filled with the injected material.

Fig. 23. Para-urethral fistula, injected with bismuth paste through the urethra.

Three days later the patient was operated on by Dr. Carl Beck, Langenbeck incision. The kidney was found markedly increased in size, especially the upper pole. It was found that the pelvis of the kidney was adherent, making it necessary to clamp the pedicle. The wound was closed in the usual manner, drainage being left in the lower angle of the wound. The wound did not close as readily as expected and bismuth paste was injected to determine the depth of the sinus, which healed very rapidly following injection. The specimen (picture of which is shown here) shows that there had been a kinking of the ureter. The kidney on section shows a marked destruction of the parenchymatous tissue with cyst formation.

For the comparison of collargol injections in cystic kidney cases in the future, we have made the following experiment: The removed kidney was injected through the cut end of the ureter with liquefied 33 per cent bismuth paste until the pressure within the kidney indicated that the cavities were completely filled. The end of the ureter was then ligated, to prevent the escape of the paste. A stereoradiogram was taken and compared with the radiogram taken before the operation with collargol injection (Fig. 16). The contour of shadows in both pictures is so strikingly similar that we can reply on the collargol injection in cystic kidney as a most valuable diagnostic adjunct. We illustrate this injected excised kidney by stereoroentgenogram Fig. 17, to show the relative size and location of these cystic cavities and to compare them with the specimen itself. We have photographed the incised kidney shown in the stereoroentgenogram, Fig. 18.

*Comment.* This case is, from a diagnostic standpoint, an excellent example for study of cystic kidney and the method led us to a correct diagnosis, and consequently, the proper treatment.

Fig. 24. Kidney abscess gravitating into pelvis, discharging pus and urine.

CASE 12, G. U. Hip-joint disease, complicated with fæcal and pararectal sinus and paravesical abscess; closure after bismuth injections.

C. V., age 26, well to the age of 14, when he suddenly developed a severe pain in the right knee. A day later the pain shifted to the hip. Diagnosis, rheumatism (?). Abscess in the hip followed and was opened at home, drainage tube inserted, and a secondary infection took place. Two years later he was operated on in Iowa City. After operation the sinus remained closed for five months, but spontaneously reopened. Thereafter sinuses appeared in different regions of the hip and finally a pararectal abscess formed, which was opened and drained.

He came to me in January, 1912. The right limb was about three and a half inches shorter than the left. Bismuth paste was injected and after three injections all sinuses closed. Two weeks later, the patient could walk around without crutches, which he had not done for years. He remained well for two years but in December 1913 suddenly developed a severe pain in the region of the lumbar vertebræ. He kept on getting worse, the pain extending anterior to the bladder. He had frequent urination, vesical tenesmus, and great tenderness over the bladder. He returned to Chicago immediately and I found a bulging over the old pararectal scar. I incised the same and evacuated about a pint of reddish pus, which was mixed with fæcal matter. It was thus evident that communication must have existed between the rectum and this abscess.

The injection of bismuth revealed a most instructive condition, which is illustrated in stereoroentgenogram (Fig. 19). The paste filled out all the pararectal sinuses which originated from the old hip-joint disease and communicated with the same.

Fig. 26. Sinuses following nephrectomy, injected, closure.

Fig. 27. Infected urinary sinus following nephrectomy. Bismuth injections cleared up infection. Urinary discharge continued.

There is a side branch, which through a narrow channel turns forward, anterior to the bladder and fills up a cavity about three inches long and about an inch wide. This can be observed only in the stereoscopic radiogram. (A single plate gives rise to a false interpretation—see Fig. 20).

After two more injections the secretions became serous; fæcal matter, as well as pus, stopped discharging and the patient regained his health with unusual ripidity and is perfectly well today.

*Comments.* The instructive features in this case are as follows: It proves that hip-joint disease (1) can produce a fistula around the bladder and is likely to perforate into the bladder; (2) that a fistula which opens near the rectum may originate in the hip-joint; (3) that such cases as this may be regarded as inoperable and still curable by this simple method of injection; (4) there is one remarkable phase of this case; namely, that in spite of the entire destruction of the hip-joint he has perfect motion and normal strength in his limb. There is a shortening of about three and a half to four inches. He can stand on the affected limb as long as he can stand on the sound one. There is the same amount of flexion as in the healthy limb, although the entire head of the femur has been destroyed and absorbed. Pictures Fig. 21 A and B demonstrate this clearly.

CASE 13, G. U. Urinary sinuses due to tuberculosis of prostate.

Dr. L. B. C., age 41, developed in 1901 bilateral pulmonary tuberculosis. He was treated in a sanitarium and a year later his pulmonary trouble was complicated by a deep perineal abscess. The latter was drained and a suppurative urinary fistula resulted, discharging for ten months. It healed spontaneously and remained closed for nearly seven years, and the pulmonary trouble had also improved. In July, 1909, the urinary fistula reopened and discharged pus and urine freely. This abscess had also opened into the rectum but the testicles remained normal. There was an enlargement of the prostate, so that he had to be catheterized. The tumor of his prostate, about the size of a lemon, was removed in a New York hospital, but the rectal, as well as the urinary, fistulæ remained.

In May, 1912, he came to me for treatment. There was one fistula on the left side of the scrotum and another two inches posterior to the anus, both discharging urine and pus. Besides these two external fistulæ there was an intrarectal sinus discharging urine.

All fistulæ were injected with bismuth paste. (Stereoroentgenogram Fig. 22 shows that all communicate with the bladder.)

After repeated injections the pus discharge diminished but the urine continued for some time, but the fistulæ have finally closed and at present the patient is perfectly well.

CASE 14, G. U. Urinary fistula through prostate with coexisting para-urethral fistula; bismuth injections; closure.

R. A., age 29, had scarlet fever at 4. One month later fell from tricycle on right hip. Within a month all symptoms of tuberculosis of the hip developed and he was radically operated on. The head of the femur was resected. At the age of 7, the hip was entirely healed, with considerable

Fig. 28. Tuberculosis of hip causing 16 urinary sinuses. No urine passed through urethra for 7 years previous to injection.

shortening and ankylosis and he had to walk on an extension shoe.

In November, 1908, at the age of 22 patient had pain in the rectum and a discharge of blood and pus. This continued for four months. February 25, 1909, a radical operation was performed on the perineum for abscess of the prostate. Two months later another abscess appeared anterior to the rectum, which was opened and discharged pus and urine. This kept discharging until July, 1909, when I made a bismuth injection through the fistula, which proved that there was a communication with the bladder. A radiogram shows the path of the fistula through the prostate into the bladder. Following this injection pus and urine stopped discharging and patient remained well up to this date.

In this case there also existed for years a small para-urethral fistula, just back of the glans penis, which discharged pus constantly and resisted all forms of treatment. I injected the paste in liquid state into the urethra, first applying a rubber constriction around the base of the penis, thus filling the urethral canal completely and the paste found its exit through the small fistula. Then I took a radiogram of the penis, which illustrates the position of the fistulous tract (Fig. 23).

The therapeutic result was most satisfactory, inasmuch as the fistula closed within a few days and has not reopened.

Case 15, G. U. Kidney abscess gravitating into pelvis, discharging pus and urine.

Figure 24 illustrates an injected fistula resulting from an abscess in the kidney of a child 4 years old. It had discharged pus and urine for several months. The injection was only made for diagnostic purposes. The case was under the care of another physician for a very serious heart trouble. The radiogram is presented to show how an abscess from the kidney may gravitate into the pelvis and not even be suspected. Pus discharge ceased but leakage of urine continued until patient died.

Case 16, G. U. Six infected urinary sinuses, discharging urine and pus for ten years. Operation and bismuth injections. Closure eight years.

Mr. W. McA., age 56, builder. When a boy of 17 he became entangled on the end of a power shaft and was spun around, pulling the penis, tearing the urethra, and bruising the testicles severely. Urinary fistulæ remained at the scrotal-perineal junction. Two years later surgeons in Aberdeen, Scotland, cauterized the fistulous tracts and they closed, but he had a very small urinary stream.

In 1892, twenty-three years ago, he began to have chills and fever. In the absence of other symptoms it was thought to be malaria and treated as such, but soon there appeared around the region of the old injury of the scrotum a formation of abscesses. These were either incised or opened spontaneously, some discharging pus, others pus mixed with urine. Later an abscess ruptured intrarectal. Practically no urine escaped from the urethra during urination but instead it escaped through all the sinuses, including the one in the rectum. His general health gradually declined and his weight was reduced from 190 to 145 pounds. For the next thirteen years he was in this deplorable condition, when he came under my observation. I found the following condition: There were six sinuses in the scrotal and

perineal region. The adjacent skin was eczematous and tissues indurated, all sinuses discharging pus and three of them urine, including the one emptying into the rectum.

In March, 1905, I resected the right testicle and performed a plastic on the urethra. About one and a half inches of obliterated urethra was removed and the ends sutured together, thereby causing considerable shortening of the penis. This was followed two weeks later by a suprapubic cystotomy and a sound passed through the urethra from the bladder side and a definite passage for the urine afforded. A permanent catheter, with one end protruding through the abdominal incision and the other through the external urethra, was left for about two weeks. It was noticed at this time that the urine contained a considerable amount of urinary salts, which deposited on the catheter and it became very difficult to keep the catheter patent.

The patient made a good recovery and during the next two years would catheterize and irrigate himself daily, this being sufficient to keep the urethra patent, but some of the suppurative sinuses persisted, the urinary were closed.

In 1910, following the formation of small abscesses and fistulous tract around the perineal and suprapubic region, a second suprapubic cystotomy was performed, with dilation of the urethra, which was contracted, and a permanent catheter inserted. About this time bismuth paste came into use and following the operation two injections with the paste were made. The fistulous tracts closed and have remained so. Since that time the patient has had occasional attacks of fever and chills, which are probably due to retention of some septic material. These attacks usually last about two days, after which the patient feels perfectly well. The urinary stream at this time, except being somewhat smaller than normal, comes freely and clear through the urethra (see stereoroentgenogram Fig. 25).

Present weight 240 pounds, or a gain of 95 pounds in the past ten years; urinary and pus sinuses closed for the past five years.

CASE 17, G. U. Pyonephrosis, nephrectomy; suppuration twelve years; closure after one injection of bismuth paste.

J. Lag., Italian, age 45. In 1898, had abscess of left kidney. It was incised and kept discharging profusely for four years. His health deteriorated, weight 120 pounds. Radical operation for removal of the kidney performed by Dr. Carl Beck in 1901. This required incision from the twelfth rib to the middle line of the abdomen. A sinus in the abdominal wall persisted for another nine years.

In 1910 an injection with bismuth paste was made and the next day the discharge ceased and within one week the sinus closed and remained so up to date. With the exception of a ventral hernia the patient is perfectly well and has gained 35 pounds.

CASE 18, G. U. Paranephritic abscess with fistula.

Mrs. LeC., was seen by Dr. Carl Beck at her home in Iron Mountain, Michigan. She has had several attacks of pain which were thought to be due to appendix or kidney infection. Finally a radiogram was taken and the diagnosis was clear of stone in the kidney. During the operation for stone an abscess was found, which was opened and drainage instituted.

After months of persistent discharge she came to Chicago to me for treatment of the fistula. Injections of bismuth paste were made (Fig. 26) at intervals of one week, and the fistula finally closed. There was a recurrence of the abscess a short time after, which was then opened and the injections resumed, with the result that the fistula closed again permanently.

CASE 19, G. U. Rectal and urinary fistulæ resulting from hip-joint disease and spinal tuberculosis.

I. B., age 36, developed hip-joint disease and spinal tuberculosis at age of nine. After a number of years of conservative treatment, abscesses formed around the hips and in the lumbar region. Several of these were incised and others opened spontaneously. At the age of 20 she had ten discharging sinuses. During the past ten years she underwent a number of surgical operations, none of which were of avail. At the age of 28 she joined the Christian Scientists, and became a most devoted disciple of that cult, receiving their constant treatment for eight years.

I saw her in 1909; she could not walk but could manage to get out of her very low bed about every half-hour to urinate, due to a chronic cystitis. The cystitis was the result of a perforation of a sinus into the bladder. One sinus perforated into the rectum and another about one inch from the anal opening. Here we have a combination of a hip and spinal tuberculosis, causing a rectal and a vesical fistula, a most distressing combination.

The bismuth treatment had the effect of closing both the fæcal and the urinary fistulæ, but several of the suppurative sinuses continued to discharge.

The patient was soon able to be up and walk for blocks, and resumed her worship at the nearest Christian Science church. In all sincerity she attributed her improvement to her faith in Christian Science. In order not to hurt my feelings she declared that I myself was a Christian Scientist, but I was not aware of the fact.

The final result could not be traced.

CASE 20, G. U. Suppurative urinary sinus following nephrotomy; bismuth injections cleared up infection. Urinary discharge continued.

Mr. M., New Orleans, age 30. Sickly for several years, when in July 1912 he was operated upon in New Orleans for a pus kidney. Subsequent to this operation a urinary fistula persisted. A small stone, irregular in shape, passed through the fistula several months after operation.

In April 1913 he was examined by me. I found a discharge of pus and urine in considerable quantities.

The injection of paste (see Fig. 27) shows a cavity two inches by one inch in diameter.

After this injection the pus discharge ceased but clear urine continued. After several more injections there was no diminution of the urinary discharge and I concluded that there was an obstruction in the ureter, either by stone or stricture, and referred the case to his physician in New Orleans for nephrectomy.

CASE 21, G. U. Tuberculous hip-joint disease; with sixteen urinary fistulæ.

J. G., age 25, at age of seven suffered with pain in his right knee. A year later an abscess formed in region of the great trochanter and shortly after many abscesses formed around the whole pelvis, all of which opened, with the final result of twelve sinuses, all discharging pus mixed with urine.

For the last seven years not a drop of urine was passed through the urethra. In 1906, Dr. S. of St. Louis curetted several of these sinuses. New abscesses formed, when he was referred to me he had sixteen urinary sinuses, his right leg flexed and hip ankylosed. The whole pelvic region was in an acute eczematous condition, due to the constant saturation of urine and pus.

I injected all the fistulæ at one time, with a 33 per cent bismuth vaseline paste, and two hours later the patient passed urine through the natural channel, the first time in seven years. The urine contained a large percentage of pus and some of the paste.

The radiogram (Fig. 28) exhibits a veritable labyrinth of sinuses. The sinuses began to close rapidly and the eczema was markedly improved, but a new trouble started: The patient developed a severe cystitis, which required irrigation of his bladder. Within two weeks eight sinuses were closed, the others markedly improved, and one only discharged a few drops of urine. In this condition he returned to St. Louis. He died one year later, as reported to me by his physician, under the care of new doctors.

## CONCLUSION

It is hoped that the study of these cases will illustrate to some degree the various types and points of technique in the proper application of the bismuth paste in genito-urinary and fæcal fistulæ. It must be remembered that we are dealing with a class of cases in which the science of surgery, medicine, and even quackery have had a chance and that out of this apparently hopeless group, a large percentage has healed.

I have found that the failures which I have had, and those which I have observed in the hands of others, were mostly due to imperfect technique. As I gradually developed a technique, my results became better and better, and I am certain that if those who wish to employ this method will study the underlying principles in the technique as I have described them, equally good results will be obtained.

Most of the cases which I report here have had more than one operation before I saw them, some as many as ten. If such results as I have shown are obtainable by a comparatively simple method like the one I have employed, such treatment ought to appeal to the patient more than the extensive surgical operations, especially since the surgeon cannot assure the patient that by operation a cure will be accomplished.

# SHOCKLESS SURGERY WITH THE AID OF PARAVERTEBRAL ANÆSTHESIA AND SCOPOLAMINE AND NARCOPHINE[1]

By Geheimrat Professor Dr. BERNHARD KROENIG and Dr. P. W. SIEGEL, Freiburg, Germany
From the University Frauenklinik

PERMIT me to present to you first the theoretical and then the practical technique of an anæsthesia which, I believe, fulfills in a large measure the demands which Crile has indicated in his notable animal experimentation. The results of Crile's experiments, as you know, are as follows:

Every psychological trauma such as fear, fright, etc., causes a morphological change in the brain-cells; likewise, every sensation of pain carried to the brain produces the same change in the brain-cells. This change occurs in the same degree when the animal is treated with inhalation narcotics as ether, chloroform, nitrous oxide, etc. If, on the contrary, the sensitive nerve-trunks are blocked at any point as is done in local anæsthesia, the sensation of pain does not reach the brain and no change of the brain-cells occurs. Prevention of this change is termed by Crile, anoci-association.

To accomplish anoci-association it is necessary to eliminate first psychic trauma, second the pain of the operation, and third the post-operative pain. The fulfillment of these three requirements would produce the ideal anæsthesia according to Crile's theory.

To eliminate the psychic trauma we have for several years preceded every operation by a twilight sleep. Until recently the scopolamine preparations have been of inconstant value. Lately, however, Straub has produced a stable and constant solution of scopolamine by the addition of 10 per cent of mannit. Morphine also has been replaced by Straub by a preparation of meconic acid morphine which bears the trade name of "narcophin." This preparation has the advantage over the usual preparations of morphine in that it is fully as efficient in eliminating pain but shows the undesirable accessory reactions in a much smaller degree. It is, therefore, possible to give relatively much higher doses of narcophine than of morphine without danger.

With these two preparations twilight sleep is induced before every operation. This is done in the following manner:

Three to two and one-fourth hours before each operation 0.0003 of "Scopolamin-haltbar," and 0.03 of narcophine is injected subcutaneously. One-fourth to one-half hour before anæsthetizing the patient, this dose is repeated, or, if the twilight sleep is already fairly deep, only one-half of this dose is injected.

To increase the depth of twilight sleep it is necessary to avoid disturbing the patient by loud noises or light. Patients in twilight sleep are particularly susceptible to stimuli of light. To avoid this the ears of the patients are plugged with "antiphone"; i.e., cotton plugs saturated with oil or wax, or hard or soft rubber plugs, and a cotton pad over the ears. The eyes are bandaged with a soft silk bandage. With these precautions we accomplish in the majority of cases a complete amnesia of the operation and preliminary preparations, or a complete indifference to the proceedings about them. Thus we accomplish the *first* of Crile's requirements; i.e., the elimination of the psychic trauma.

The *second* requirement is the blocking of the nerves. This might be done in laparotomies and gynecological operations by spinal anæsthesia, or by *conduction anæsthesia* outside of the dural space. I shall not further consider the advantages and disadvantages of spinal anæsthesia, for I consider it entirely surpassed by the conduction anæsthesia which we practice here. I consider the con-

[1] Read before the visiting members of the American Gynecological Club in Freiburg in Baden, July 25, 1914, by Professor Kroenig. The material was gathered by Dr. P. W. Siegel in the Frauenklinik under the direct supervision of Professor Kroenig. The paper was translated from the German by Dr. Frank Konrad of Boston, Harvard Medical School, and assistant in the Frauenklinik of Freiburg. Because of the war the publication of this paper has been delayed. In the meantime the results of 420 new cases have been added.

duction anæsthesia the most perfect form of local anæsthesia.

This form of anæsthesia gives a large field for operation outside of the area of infiltration and eliminates the undesirable anæmia and infiltration of the field which results in the usual forms of local anæsthesia. The conduction anæsthesia, however, will be ideal only when all operations, especially laparotomies, are possible under it.

As early as 1905 our clinic had considered the conduction anæsthesia, and Sellheim, former assistant here and now professor in Tuebingen, used it first and spoke of his results at the Kongress der Deutschen Gesellschaft fuer Gynaekologie in 1906. At that time he interrupted the intercostal nerves directly outside of the spinal column, and the ilio-inguinal and iliohypogastric nerves on a level with the anterior superior iliac spine by the injection of cocaine. The attempts at that time gave only imperfect results and failed principally on account of the danger of the cocaine. Since this time, however, the chemical industries have worked with great success on the preparation of anæsthetics with the same anæsthetic but less toxic qualities than cocaine. So far "novocaine" has proved itself the safest.

When I returned from America where I had seen the convincing histological demonstrations of Crile, I again recalled these experiments. An added stimulus was the success of Braun in a new infiltration process in which the sacral nerves were blocked directly at their exit from the sacral foramina, and termed by him "parasacral anæsthesia." This in fact was merely a continuation of the experiments of Sellheim, in which the intercostal nerves were blocked immediately at their exit through the intervertebral foramina, and termed by him "paravertebral anæsthesia."

Braun succeeded in carrying out all operations on the vagina and perineum successfully with this form of anæsthesia. We continued a step farther in contending that, since it was proved by the investigations of Ramstroem that the abdomen is innervated only by the intercostal nerves of the corresponding thoracic segments, it would be necessary in laparotomies to block only the intercostal and lumbar nerves innervating the field of operation.

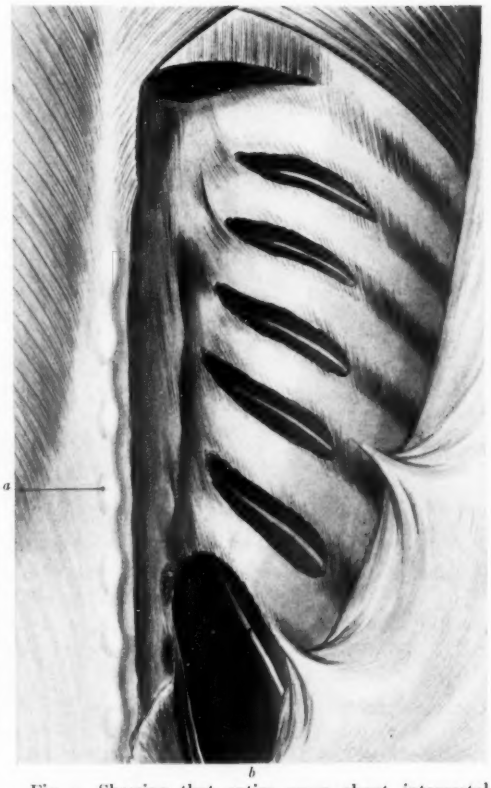


Fig. 1. Showing that entire space about intercostal nerve (*b*) to be blocked was infiltrated. *a*. Spinous process of the twelfth thoracic vertebra.

Paravertebral anæsthesia is quite simple in surgical laparotomies. Stomach, gall-bladder, and bowel operations are carried out without difficulty because the innervation is relatively simple; the organs themselves are not sensitive. It is necessary to determine only the desired field of operation and to block the corresponding intercostal nerves. The conditions in gynecological laparotomies, however, present greater difficulties. The peritoneal coverings of the genital organs that lie in the pelvis, as well as the broad and round ligaments, are innervated by nerves from the lumbar and sacral plexuses. It is therefore necessary in gynecological laparotomies to

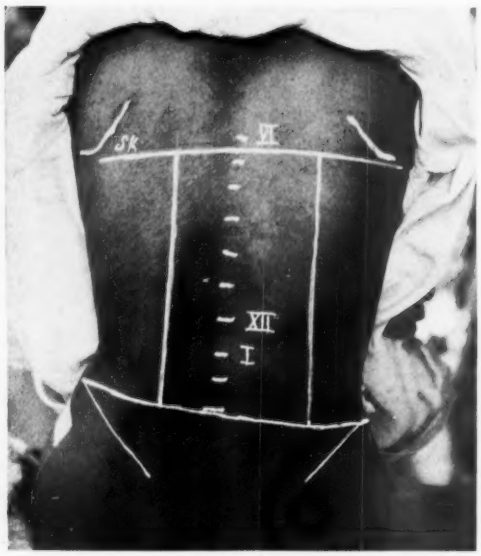


Fig. 2. Showing the first steps in blocking the nerves for paravertebral anæsthesia.

Fig. 3. Showing the needles in position for injection.

use a combination of the parasacral and paravertebral anæsthesias.

*The paravertebral anæsthesia serves for the anæsthetization of the abdominal wall, the peritoneum and the relaxation of the abdominal wall; the parasacral anæsthesia serves for the anæsthetization of the pelvic peritoneum and ligaments.*

For vaginal operations the parasacral anæsthesia is usually sufficient. However, since the pelvic ligaments are innervated in part by the ilio-inguinal, iliohypogastric, and femerocutaneous lateralis, and since the pelvic peritoneum is pulled upon, it becomes necessary to add a paravertebral anæsthesia to accomplish perfect results. This, however, is necessary only when the operation includes the uterus and adnexæ.

Up to date we have done (till September 15, 1915), 556 gynecological and 114 obstetrical operations with conduction anæsthesia only; i.e., with paravertebral or parasacral, or combined paravertebral and parasacral anæsthesia. The cases include all the usual gynecological and obstetrical operations. In the tables here shown will be clearly seen the results which we have obtained. Table I shows the various operations performed with this form of anæsthesia.

TABLE I

| | |
|---|---|
| Operations through incision over Poupart's ligament: | |
| Inguinal herniotomy | 3 |
| Femoral herniotomy | 6 |
| Alexander Adams operation | 45 |
| Tubal sterilizations | 51 |
| Total | 105 |
| Vaginal operations: | |
| Whitehead operation for hæmorrhoids | 1 |
| Vaginal hysterectomy | 14 |
| Submucous myoma | 4 |
| Cervix amputations | 19 |
| Colporrhaphies, levator suture | 105 |
| Colpotomies | 2 |
| Total | 145 |
| Laparotomies and nephrectomies: | |
| Gall-bladder, bowel operations | 23 |
| Appendectomy (Kocher) | 41 |
| Ventral fixation (Doléris) | 54 |
| Adnexa operation | 96 |
| Total hysterectomy | 31 |
| Herniotomies (abdominal scar) | 7 |
| Removal of ovaries | 37 |
| Nephrectomies, nephropexies | 14 |
| Bladder operations | 3 |
| Total | 306 |

I wish to mention that the paravertebral anæsthesia is particularly difficult in tube-

Fig. 4. Patient in lithotomy position ready for injections for parasacral anæsthesia.

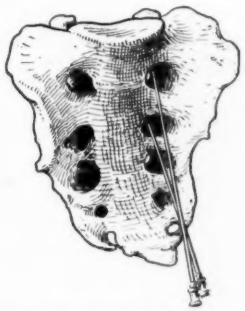

Fig. 5. Drawing from Braun showing method of introducing needle in parasacral anæsthesia.

sterilization and in the Alexander-Adams operations because the round ligament is innervated by the ilio-inguinal, iliohypogastric, and external spermatic nerves and by fibers from the sacral plexus, as we have found by experience. The round ligament especially presented the greatest difficulties. Perfect results with it were obtained relatively late, and the greater part of the added inhalation anæsthetics in the early part of our work was necessary on account of the round ligament.

Table II shows 556 operations performed with a total duration of 509 hours and 46 minutes, and a duration of peritoneal opening of 202 hours and 9 minutes. Of these operations, 475, i.e., 85 per cent, were done without any added inhalation, and in the remaining 81 operations a total of 80 ccm. of ethyl chloride, 63 ccm. of chloroform, and 736 ccm. of ether were used. This would give an average of 0.36 ccm. ethyl chloride, 0.11 ccm. chloroform, and 1.33 ether per operation in 556 gynecological operations with an average duration of 55 minutes per operation. Considering that in these estimations there was no choice of cases and that all earlier attempts were included, we must consider these results as quite satisfactory. At present, of course, additional inhalation is used with much less frequency than was done three months ago. So far we have never experienced a total failure. The conditions of the case make it highly probable that at times a nerve may be skipped or insufficiently anæsthetized. The worst that can happen is a partial success.

Table III shows 114 obstetrical operations, of which 108, i.e., 95 per cent, were done without any additional inhalation; in the other six the use of a total of 29 ccm. of ether and 5 ccm. of ethyl chloride is so slight as to be of minor consideration.

Before I continue on the technique of paravertebral anæsthesia let me say a few words regarding the drugs used. We use novocaine-suprarenin "A" in tablet form, prepared by Farbwerke-Hoechst, in one-half

TABLE II

| Operations | Number | Duration in Minutes | Opening of Peritoneum Minutes | Ethyl Chloride ccm. | Chloroform ccm. | Ether ccm. | With Inhalation in Addition | Without Inhalation in Addition |
|---|---|---|---|---|---|---|---|---|
| Groin Incisions | 105 | 3,595 minutes | | | | 63 | 11 | 95 |
| Laparotomies and Nephrectomies | 306 | 18,792 minutes | 11,431 | 45 | 55 | 636 | 60 | 246 |
| Vaginal operations | 145 | 8,199 minutes | 698 | 35 | 8 | 37 | 10 | 135 |
| Total | 556 | 30,586 or 509 hours 46 minutes | 12,129 or 202 hours 9 minutes | 80 | 63 | 736 | 81 | 475 |

Fig. 6. Shows the position of the needles in the patient in parasacral anæsthetization.

per cent solution, and herein differ from the usual methods of conduction anæsthesia. By using this dilute solution we are enabled to inject large quantities of fluid before reaching the toxic dose, and since all the injections are perineural it is clear that the nerve is reached with greater certainty than with a smaller quantity. The truth of this was demonstrated on the cadaver through the kindness of Professor Keibel, as is shown in Fig. 1. This shows that the entire space about the intercostal nerves to be blocked was infiltrated by our method of injection. There remained only the question whether a half per cent solution would be strong enough to anæsthetize the respective nerve-trunks, and our experience has proved that it is sufficient.

The principle of paravertebral anæsthesia consists in the blocking of the nerve immediately at its exit through the intervertebral foramen. To reach this point we use the following technique (Fig. 2). The patient is placed on the table in the sitting posture with the head bent slightly forward. The iliac crests are located by touch; the spine of the third or fourth vertebra lies on a level with a line connecting these points. In a similar manner the angles of the scapulæ are located; the spine of the sixth or seventh vertebra lies about on a level with a line connecting these points. The intermediate spinous processes are then marked off, and a line parallel to the midline is drawn on both sides of the midline and four centimeters out. The needle is now introduced vertically down on the rib on a level with the spinous process; the rib next in number to the spinous process is thus touched.

If the lumbar nerves are to be blocked, the transverse processes are used as guides instead of the ribs. After locating the rib or

TABLE III

| OPERATION | Number | Ethyl Chloride | Chloroform | Ether | With Inhalation | Without Inhalation |
|---|---|---|---|---|---|---|
| Post-abortive curettage | 22 | 5 | | | 1 | 21 |
| Colpoperineorrhaphy | 19 | | | | | 19 |
| Forceps | 28 | | | | | 28 |
| Vaginal section | 10 | | | 2 | 1 | 9 |
| Abdominal section | 27 | | | 27 | 4 | 23 |
| Manual removal of placenta | 2 | | | | | 2 |
| Induction of premature labor | 1 | | | | | 1 |
| Cephalocranioclasis | 3 | | | | | 3 |
| Porro cæsarean section | 2 | | | | | 2 |
| Total number of operations | 114 | 5 | | | 6 | 108 |

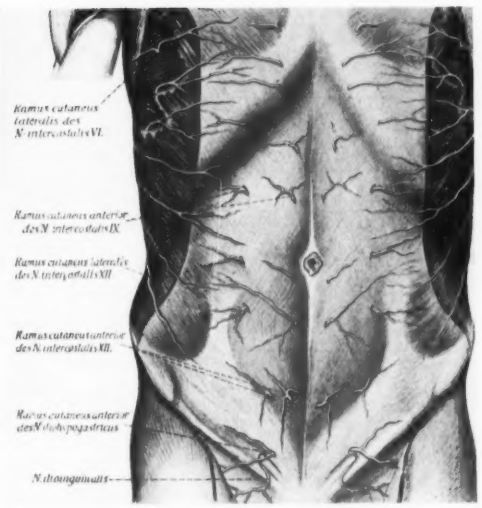
Ramus cutaneus lateralis des N. intercostalis VI.
Ramus cutaneus anterior des N. intercostalis IX.
Ramus cutaneus lateralis des N. intercostalis XII.
Ramus cutaneus anterior des N. intercostalis XII.
Ramus cutaneus anterior des N. iliohypogastricus
N. ilioinguinalis

Fig. 7. Showing the fibers of the sixth intercostal nerves running about on a level with the xiphoid process.

Fig. 8. Showing genitofemoral nerve dividing into the external spermatic and lumbo-inguinal nerves.

transverse process with the point of the needle, the needle is raised and inclined outward about ten to twenty degrees and pushed from two to three centimeters deeper, so as just to pass the lower border of the rib (Fig. 3).

Here are seen two needles standing vertically over the ribs. The two upper needles are in position for injection: the angle is plainly visible. Now 15 ccm. of a one-half per cent solution are injected into each intercostal space, and in such a manner that at the beginning of the injection the needle lies deep, and is then gradually withdrawn so that at the end of the injection the point of the needle is on a level with the surface of the rib. This needle is now about on a level with the needle which is still on the rib. In other words, the needle point is on a level with the surface of the rib, and the whole area from the point of beginning the injection to the end of the injection is infiltrated with anæsthetic fluid.

We use for the injections a needle six centimeters long for the thoracic nerves, and eight centimeters long for the lumbar nerves as described by Braun.

To make the injections for the parasacral anæsthesia we place the patient in the lithotomy position with slightly raised pelvis, as is seen in Fig. 4. The technique is very much the same as that described by Braun, except that we use a one-half per cent solution. At first we locate the tip of the coccyx and mark

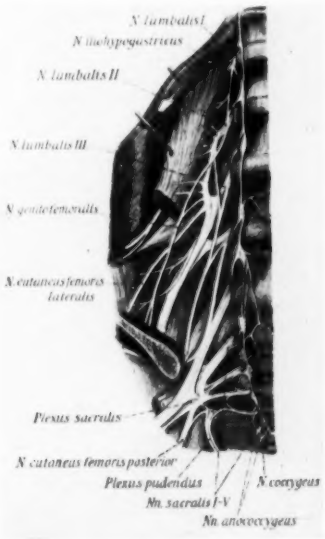


Fig. 9. Shows the sacral nerves run together into the sacral and pudendal plexus.

TABLE IV

| | | | |
|---|---|---|---|
| Appendectomy | Paravertebral | Right dorsal 5–12<br>Right lumbar 1–3 | Incl. @ 20 ccm. = 220 ccm. ½% = 1.1 grams |
| Nephrectomy | Paravertebral | Right or left<br>Dorsal 4–12<br>Lumbar 1–3 | Incl. @ 20 ccm. = 240 ccm. ½% = 1.2 grams |
| Laparotomy for abdominal work | Paravertebral | Right and left<br>Dorsal 5–12<br>Lumbar 1–3 | Incl. @ 15 ccm. = 330 ccm. ½% = 1.65 grams |
| Cæsarean section | Paravertebral | Right and left<br>Dorsal 9–12<br>Lumbar 1–3<br>Sacral (1–5) each side | Incl. @ 15 ccm.<br>@ 60 ccm. = 330 ccm. ½% = 1.65 grams |
| Laparotomy for pelvic work | Paravertebral | Right and left<br>Dorsal 8–12<br>Lumbar 1–3<br>Sacral (1–5) each side | Incl. @ 15 ccm.<br>@ 45 ccm. = 330 ccm. ½% = 1.65 grams |
| Inguinal incision (bilateral) | Paravertebral | Right and left<br>Dorsal 11–12<br>Lumbar 1–3<br>Sacral (1–5) each side | Incl. @ 15 ccm.<br>@ 90 ccm. = 330 ccm. ½% = 1.65 grams |
| Vaginal operations on uterus and adnexæ | Paravertebral | Right and left<br>Lumbar 1–3<br>Sacral (1–5) each side | Incl. @ 20 ccm.<br>@ 100 ccm. = 320 ccm. ½% = 1.6 grams |
| Prolapse operation | Paravertebral | Right and left<br>Sacral (1–5) each side | @ 125 ccm. = 250 ccm. ½% = 1.25 grams |

two points, one on either side 1½ to 2 cm. from the midpoint on a level with the tip of the coccyx.

Figure 5 is taken from Braun's textbook and shows the method of introducing the needle. The needle is introduced at the points marked off on a level with the tip of the coccyx and pushed forward till an obstruction is met. This usually happens at a depth of 7 to 8 centimeters, and the needle point is then at the second sacral foramen. Now 25 ccm. of a one-half per cent solution are injected after withdrawing the needle one-half to one centimeter. Then 35 ccm. are injected while the needle is gradually withdrawn to the skin; the third, fourth, and fifth sacral foramina are thus injected. The needle is then completely withdrawn and introduced again at a slightly greater angle with the sacral axis and parallel to it sagitally until an obstruction is met; now the point of the needle is at the first sacral foramen and about 10 to 12 ccm. deep. After withdrawing the needle about 1 cm., 20 ccm. of a one-half per cent solution are injected.

Figure 6 shows the position of the needle in the patient. The needles shown are both 15 cm. long. The first needle is at the second sacral foramen; the other, equally long but at a greater angle and about 3 cm. deeper, is at the first sacral foramen. The angle can be plainly seen. In practice we use only one needle. The two needles are here used to demonstrate the introduction of the needles. Finally the needle is entirely withdrawn, inclined well outward, and pushed between the tip of the coccyx and the rectum. Here 5 ccm. are injected to block the anococcygeal nerves.

The whole success of conduction anæsthesia depends on an exact knowledge of the innervation of the field of operation. As is well known, the viscera themselves are not sensitive; likewise the sympathetic nerves are not sensitive to pain. The skin, fascia, and peritoneum are sensitive to pain; also pulling on the mesentery causes pain. In spite of the correct anatomical localization of the nerves our clinical knowledge of their distribution is rather primitive. Since we know from the demonstrations of Ramstroem, as I have mentioned above, that in the innervation of the abdominal cavity the intercostal and lumbar nerves only need be considered, we are acquainted with the most important factors. The following illustrations show in a simple manner the innervation of the various fields:

Figure 7 shows the fibers of the sixth intercostal nerves running about on a level with

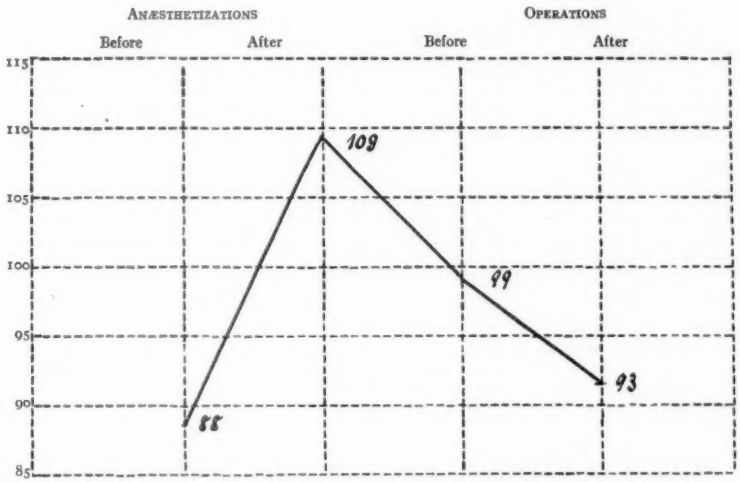


Fig. 10. Pulse curve taken from 670 successive anæsthetizations.

the xiphoid process. If we wish to perform an operation including the entire abdominal cavity we must block the nerves from the sixth intercostal nerves down. If, on the contrary, we wish to make a transverse incision and operate only on the genital organs, blocking of the nerves from the eighth intercostal space down is sufficient. It is seen also that the region of the groin is innervated by the iliohypogastric and ilio-inguinal nerves.

Figure 8 shows the genitofemoral nerve which divides into the external spermatic and lumbo-inguinal nerves and plays an important part in the innervation of the inguinal region, and especially of the round ligament. The femerocutaneous also requires consideration.

These nerves are branches from the lumbar nerves; the femerocutaneous-lateralis springs from the third lumbar nerve, the genitofemoral from the second, and the ilio-inguinal and iliohypogastric from the third. It is therefore necessary that in every gynecological operation the first and second and usually the third lumbar nerves be blocked.

Figure 9 shows that the sacral nerves all run together into the sacral and pudendal plexus. The entire vaginal and perineal regions, the broad and round ligaments, and in part the peritoneal coverings of the genital organs are innervated by them.

On the strength of anatomical demonstrations and clinical experience, we have prepared the following scheme (Table IV).

For an appendectomy it is necessary to block the nerve-trunks on the right side from the fifth dorsal to the third lumbar nerves inclusively: likewise for a nephrectomy. For general surgical operations such as gall-bladder and bowel operations the nerve-trunks from the fifth dorsal to the third lumbar nerves inclusively; for gynecological laparotomies blocking of the nerves of both sides from the eighth dorsal to the third lumbar nerves inclusively, and light anæsthetization of the sacral nerves is necessary.

The largest dose that we use here is 1.65 grams, that is, 330 ccm. of a one-half per cent solution, but lately we have given a dose of two grams without any alarming effects. The operation may be started from ten to fifteen minutes after beginning the injection.

Minor accessory reactions have been noted. In the first place I mention the behavior of the pulse. During the anæsthesia it becomes smaller and increased in frequency, but this is of minor importance as it reaches its original frequency and strength at the end of the operation.

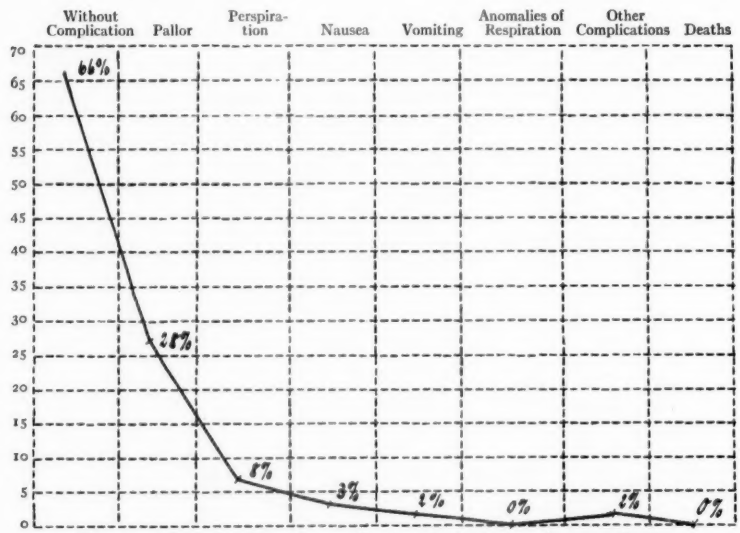


Fig. 11. Chart showing the complications in 670 successive anæsthesias.

Figure 10 shows the pulse curve of 670 cases. It shows a rapid rise to 109 beats per minute after anæsthetization; a gradual fall to 99 at the beginning of the operation; and a further gradual fall to practically normal toward the end of the operation.

The respirations were controlled in 650 cases, and gave an average of nineteen per minute. The remaining accessory reactions were, as I have said, slight. I can best demonstrate this by the curve shown in Fig. 11.

*Four hundred and fifty cases, i.e., 66 per cent of all cases showed no accessory reactions. No death resulting from the anæsthesia was observed.* The convalescence of the cases was satisfactory, and no complications due to the anæsthesia were noted.

As a summary let me again show you a table of the figures obtained in our combined results (Table V).

Five hundred and eighty-three operations, i.e., 87 per cent of all cases, were done without any added inhalation. In the others the addition was so slight as to be of almost negligible importance. There occurred during the anæsthesia only minor and comparatively harmless complications. The after-effects, too, which were all transient, might have been due to the operation itself. The convalescence was generally quite smooth.

With the paravertebral anæsthesia we have thus fulfilled the second of Crile's requirements; i.e., the elimination of the operative pain.

Our next consideration is the post-operative pain. This is made up of two components; namely, the pain in the wound and the pain due to the distention.

To relieve the pain in the wound we have dusted into the incision after closure of each

TABLE V

| Operations | Number | Ethyl Chloride | Chloroform | Ether | With Inhalation | Without Inhalation |
|---|---|---|---|---|---|---|
| Gynecological Operations | 556 | 80 | 63 | 736 | 81 | 475 |
| Obstetrical Operations | 114 | 5 | | 29 | 6 | 108 |
| Total | 670 | 85 | 63 | 765 | 87 | 583 |

layer a powder called *anæsthesin*. This is slowly dissolved and absorbed. We have begun these attempts coincidently with others, and can so far report on about fifteen cases. The results, however, are not quite satisfactory. A reduction of the pain in the wound was accomplished, and in some cases a complete elimination of the pain, but in practically all cases there was an exudation and considerable hæmatoma. A coincident rise of temperature was not noted, and later the wounds all healed. The use of the drug for this purpose might, therefore, be recommended with some hesitation.

The pains due to the distention can probably not be entirely avoided. The best that we can accomplish will be to shorten their duration. I shall not further mention the methods used, for no doubt you are familiar with them.

While we may now say that we have fulfilled the first two of Crile's requirements, there still remains a large field for the accomplishment of the third.

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## FINAL RESULTS IN TWELVE CASES OF COLECTOMY

By JOHN G. CLARK, M.D., F.A.C.S., Philadelphia, Pennsylvania

IN most of the literature bearing upon intestinal stasis one finds, as the basic motive for surgical intervention, the statement that the colon is a structure of more or less obsolete or perverted function. Startling assertions have been made as to the uselessness of the large intestine, and every conceivable method for restoring this so-called drainage system has been suggested in order to obviate the evils of colonic toxæmias.

To Metchnikoff are attributed the theories concerning the noxious influence of the fermentation products of the large intestine, but it is to Lane that we are indebted for the initial step in the surgical treatment of these cases. In Lane's most recent monograph, "The Operative Treatment of Intestinal Stasis," published in 1915, he quotes Metchnikoff's statement regarding his surgical efforts as follows: "The results of his (Lane's) operations show: (1) That life is possible without a great intestine: (2) that in certain cases the conditions of life are improved." With this brief summary we are all, I believe, in accord. So far as my own observations go, I would lay particular stress upon the word "certain" as a limiting adjective, choosing to regard it of minimum rather than of maximum scope. Indeed, from the experience of most investigators it is evident that in only an occasional case are the conditions of life improved. If one views Lane's book in an attempt to find anything more than startling theoretic assertions borne out by a very limited marshaling of facts, one is doomed to disappointment. There are here no well-digested series of case records from which one is able to draw conclusions as to the correctness of his assertions. Here and there an isolated history is inserted to sustain this or that theory. In a thesis so revolutionary in character as this one, every case upon which the author has operated should be detailed fully. It is not the occasional brilliant result that counts in a work of this unusual character, but it is the analysis of all the cases that have come under the operator's care, with full histories and a painstaking follow-up record system, that permits the reader to bring his own judgment to bear on this very important subject. Until such records have been presented, the integrity of these hypotheses must rest on our personal experience and on that of other surgeons.

I cannot refrain from referring to some of the bizarre statements made by Lane in his most recent publication. In his description of the vicious influence of intestinal stasis, he portrays, in vivid style, the decadence of an attractive woman who has become a prey

[1] Presented in the Symposium on "Intestinal Stasis" at the Clinical Congress of Surgeons of North America, Boston, October 25–29, 1915.

to this type of progressive toxæmia. He depicts the fair skin becoming pigmented; the splendid, rounded figure losing fat; the breasts becomming flabby and pendulous, and a sunny temperament being overcast by the deepening gloom of an ever-increasing mental and nervous depression. He follows the downward path of physical transformation and decline until "the whole contour of the woman alters conspicuously in the most objectionable manner." He then asserts that, with a radical change in the perverted drainage system, these objectionable conditions will disappear more or less completely. It is interesting to learn that red-haired persons may survive even the fierce onslaught of intestinal stasis, for Lane has discovered that the darker-haired subject loathes the sight of food and frequently abhors any sexual relationship, whereas the red-haired patient rarely manifests these symptoms, even in the extreme conditions of intestinal stasis. In view of the rapid degeneracy of the race due to intestinal stasis such an observation should be seized upon with avidity by the various eugenic societies so that, by converting the human race into a stock of sturdy red-heads, it may be saved from a direful fate.

Lane may perhaps be hinting at this eugenic solution when he states that, through the enlargement of the uterus in pregnancy, the viscera are bolstered up, fat accumulates, and thus "a toxic, thin, miserable girl may be converted into a plump, clean, happy one by pregnancy." Because of this splendid regeneracy he hazards the astounding suggestion that "it would seem almost justifiable in the unmarried girl in certain circumstances to resort to pregnancy rather than to operative interference."

A still more startling statement is made concerning the difference in the effects of the toxic influence upon vascular change in the two sexes. Although I believe we are all ready to admit that the toxic material must be the same in men as in women, and that in both sexes the vascular systems and central nervous centers are similar, yet, in the face of this toxic and anatomic identity, Lane offers the following statement: "Generally speaking, the soft heart and low blood-pressure are common in the female subject, while the enlarged heart and high blood-pressure are frequently observed in the male." Judged from a logical standpoint, could two statements be more diametrically opposed to each other?

In spite of the high regard we all have for Lane's splendid surgical skill, such divergent statements as these cannot be accepted. Beyond Metchnikoff's assertion that Lane has proved that life is possible without a great intestine, and that, in certain cases, the conditions of life may be improved, I am sure that not many of us would dare to invade further what appears to be a fanciful realm. Lane alludes to Addami's critical lecture on this subject, which appeared in the *British Medical Journal* in 1914, and quotes the latter's criticism. Addami approaches the subject not from the viewpoint of the clinician, but from that of the pathologist, and propounds the query as to how far he may accompany Sir Arbuthnot and to what extent his doctrine may be accepted, for, he says, "at first sight these seventeen symptoms and nine diseases indirectly induced seem to be in a horrible jumble."

So far as my own experience goes, I have taken up only that phase of this work which applies to that type of constipation so intense in degree as well nigh to constitute an obstruction. My series consists of twelve cases of colectomy. In following the subsequent course of these cases my enthusiasm has diminished rather than increased. In analyzing these cases I find that half may be regarded as satisfactory surgical results, the others leaving much to be desired. Several of the cases have done well for a time, only to be followed later by the symptoms of progressive constipation, and at least four cases are quite as dependent upon enemata and drastic purgatives as they were before the colon was removed, and one died several weeks after her discharge from the hospital from an intestinal obstruction.

An X-ray study of three of these individuals shows that the ileum has undergone such marked dilatation as to deceive the roentgenologist into the belief that the colon had not really been removed.

If I had not read Lane's book, I should have regarded this sequel as due to defective operative technique, but he refers to this very danger as one of the evil sequels of the operation. In seeking an explanation for this unfortunate result, I agree with Lane that the formation of adhesions may be responsible in some instances, but I am convinced that in others this disability must be attributed to serious anatomic and physiologic defects created by the operation.

Great stress is being laid by some observers — particularly by Case — upon the necessity of having a competent ileocæcal valve if proper intestinal function is to be maintained. Is it not probable that when we sever the ileum and implant it in the lower end of the sigmoid after the removal of the colon we make two serious errors: first, in destroying the ileocæcal cut-off; and second, in forcing the small intestine to assume the vicarious function of the colon, thus gradually but irreparably causing a dilatation of the small bowel? Herein, I believe, lies the source of at least one cardinal error. I cannot attempt to discuss this subject in its relation to the "seventeen symptoms and nine diseases," for I have not had the temerity to venture into a field that appears so visionary.

As the result of my experience, however, I am convinced of one main fact, and that is, that as yet no technique has been evolved that meets an absolutely satisfactory surgical demand. Lane's own experience appears to confirm this view, for at first he made a side-to-side anastomosis and later abandoned it because the small blind sac of the terminal end of the iliac side of the anastomosis would dilate. This also occurred in two of my cases, making a second operation for its correction necessary in one case. To obviate this evil, Lane asserted that an end-to-side anastomosis would work successfully. He demonstrated his technique in this country two years ago. but the method has apparently failed, for in his latest publication he discards this plan, and declares that an end-to-end anastomosis of the ileum with the rectum is necessary. Is it not probable that, with the shifting sands of clinical experience, even this last plan of procedure will fall? In my opinion this is bound to occur in a considerable percentage of cases for *I do not believe that the small intestine will routinely take over the vicarious function of the colon.*

Speaking from my own experience, I would say that complete excision of the colon carries with it too high a mortality, and that the ultimate post-operative results are too unsatisfactory to justify so hazardous a procedure, except in the rarest instances. Mere operative mortality should not deter us from performing the operation, for in my own cases no primary surgical death has occurred, but the dangers of peritoneal adhesions, which have caused one death in our series four months later, and have necessitated a second operation in two others, and possibly the same sequel is forecasted in still others, constitutes a post-operative risk too real to be ignored. When in these cases the function of the small intestine becomes impaired, even though it may have acted most satisfactorily in the earlier post-operative months, it is difficult or impossible to overcome this serious defect and further surgical efforts at relief are almost prohibitive.

I feel constrained, therefore, to abandon the total removal of the colon except in rare instances, but I still consider that some of these otherwise hopeless cases may be relieved by following the plan adopted by Moynihan. This last observer sets forth, in his usual brilliant style, the dangers of total colectomy, but speaks optimistically of the possibilities of better results following a partial excision of the large intestine. He discards ileosigmoidostomy, for he asserts that no method of anastomosis will prevent a backward flow into the upper limits of the colon. To obviate this difficulty, he believes, that nothing short of colectomy offers a substantial hope for cure. He limits his excision to the last part of the ileum, the cæcum, and the ascending and a portion of the transverse colon. If the descending colon and sigmoid are too long, he mobilizes the remaining colon so that all acute bends are corrected. By thus limitating the operation, that very important structure, the omentum, is not sacrificed, and the danger of the formation of adhesions is greatly minimized.

W. J. Mayo undoubtedly voices the opinion of every conservative surgeon when he says: "The number of persons whose condition would warrant the risk of the operation is comparatively small, and I cannot but deplore the widespread adoption, by the medical profession, of surgical measures for this and allied conditions while they are in the experimental stage, with little evidence to show that the supposed cures are permanent."

## SUMMARY OF THE POST-OPERATIVE RESULTS IN 12 CASES OF COLECTOMY

In the *Transactions of the Southern Surgical and Gynecological Society* for 1913, I have recorded in much fuller detail the results in eight cases of colectomy, and I now offer a brief abstract of these and of four additional cases, together with the reports as to their condition up to the present time. Some of the cases recorded two years ago as being satisfactory have remained so, but one or two others that were considered as progressing favorably at that time have not maintained their improvement.

It is this tendency toward retrogression that has made us recede slightly, even from the conservative attitude which we assumed from the very beginning. If the removal of the colon in these extremely constipated individuals would lead to permanently good results it would be well worth the effort, even though the preliminary mortality might be considerable; otherwise, however, the operation is not justifiable. In the light of my own experience I do not feel that total removal of the colon has given sufficiently good permanent results to justify its use except in rare instances, and then usually under the modified plan suggested by Friedrich and advocated by Moynihan.

If the ileum is anastomosed to the middle or outer third of the transverse colon, the dangers of reverse peristalsis may possibly be obviated, and a competent and sufficiently capacious reservoir maintained to relieve the ileum from back pressure, with its consequent dilatation.

CASE 1. Gynecologic No. 3,066. The patient was first seen October 5, 1909, when she gave the following history: As long ago as she can remember she has suffered from such intense constipation that large doses of purgatives were required to give relief. For the last twenty years she has been subject to attacks of what she describes as "stomach trouble." During this time there have been distention and pain after eating. She is subject at times to vomiting spells, which are followed by comparatively long intervals of freedom from these attacks. She presents an emaciated appearance. The abdomen fluctuates between flatness and tympanitic distention. As this was a case of general ptosis, with excessive redundancy of the sigmoid, a lateral anastomosis was made from one limb of the redundant loop to the other, in the hope that this would overcome the constipation. The examination of the upper abdominal organs failed to reveal any visible pathologic condition.

The patient made a satisfactory operative recovery, and during her stay in the hospital the bowels were kept regular and there were no gastric attacks. After returning to her home, however, the patient made no perceptible improvement.

She was readmitted to the hospital February 2, 1912, when she gave the following history: Since the operation, two years ago, there were periods of a month during which she was moderately well, but for most of this time she was extremely constipated. The constipation was associated with attacks of severe vomiting. At times she is awakened out of a sound sleep by an attack of sharp pain. She vomits food taken two days previously. There is considerable general abdominal pain, and when this radiates to the upper abdomen she begins to vomit. There is constant pain in the back and hip. She cannot work, even the slightest exertion being followed by exhaustion. There is also a history of gastric tetany.

The possibility of removal of the colon was discussed, and the patient gave ready consent to any operative measure that might afford her relief.

A second median incision was made. No adhesions were encountered. Perfect anastomosis had taken place between the limbs of the sigmoid flexure, and there was no evidence of any defect in the operation that might in any way explain the progressive symptoms. The colon, as was previously demonstrated, was situated low in the pelvis and the hepatic flexure had disappeared entirely. The stomach was more markedly dilated than at the previous operation, and on examination the pylorus was found to be a large, indurated mass, apparently of inflammatory origin. This had become evident since the previous operation, for at that time there was no palpable or visible lesion of the duodenum or pylorus. As the mass was fixed, a simple posterior gastro-enterostomy was performed. The ileum was then detached from the cæcum and attached to the sigmoid flexure by a lateral anastomosis. The colon, from the cæcum to the splenic flexure, was quickly removed, this being done with comparative ease, as the entire

organ could readily be pulled out upon the surface of the abdomen.

Convalescence was rapid and uneventful, and from the day of operation she had one or two stools daily without the use of drugs. Her appetite improved at once, the pain disappeared, and the results of the operation apparently were altogether satisfactory.

The patient continued to improve steadily, when suddenly, four months later, she was seized with obstructive symptoms for which an operation was performed in another hospital. An adhesive band that was found to cause the obstruction was released, but the patient failed to recover.

This case illustrates a danger that may arise after any abdominal operation, but is especially likely to occur after a colectomy when the omentum has been sacrificed. As regards the immediate results of the colectomy they were ideal and promised the most satisfactory outcome, but the patient became the victim of one of the grave dangers of this operation—the formation of intestinoventral or intestino-intestinal adhesions.

CASE 2. Gynecologic No. 3,404. The patient was admitted to the hospital August 25, 1910. She has always been subject to constipation, but from the time her first baby was born this symptom assumed an obstructive character. She has pains in both kidney regions, becomes nauseated, and has cold, clammy sweats with paroxysmal pain in the lower abdomen. Beginning with simple laxatives, she has progressively increased the strength of cathartics until now she takes Epsom salts every day. She has gone twelve days without a movement. Prior to her entrance into the hospital, the bowels did not move for five days, although she had taken large doses of purgatives.

An exploratory incision was made with a view of relieving the acute symptoms, and taking such necessary operative steps as the abdominal conditions demanded. The position of the colon bore out the X-ray findings—the flexures, particularly the hepatic, had disappeared, and the largest part of the colon was situated in the pelvis. The colon could readily be drawn out through the incision, rendering its resection comparatively easy. The ileum was detached, and a lateral anastomosis effected between it and the lower end of the sigmoid flexure. The ascending and transverse portions of the colon were removed.

The patient withstood the operation well, but marked symptoms of shock speedily appeared, from which she recovered slowly. Following the operation the patient had daily bowel evacuations—frequently as many as three or four a day.

After leaving the hospital the patient improved progressively. The bowels moved once or twice daily without the use of cathartics, this making the most radical change in the patient's life, for she states that she had not had a natural bowel movement for years.

May 12, 1912: The patient has made satisfactory progress since the last note. The bowels now move once daily, and the stools are formed. Thirst is present, but at most she does not drink more than eight glasses of water a day. She has slight attacks of pain in the epigastrium, and occasional nausea. She now weighs 110 pounds—the heaviest she has ever weighed. She attends to her household duties, and has the care of a semi-invalid daughter. The only distress she complains of is the bearing-down sensation that comes from a relaxed pelvic floor. September, 1913: The patient reported for examination at the University Hospital, and stated that she is now quite well.

From an analysis of this case I would say that the following improvements were effected: (1) Absolute relief of constipation; (2) marked improvement in nutrition; (3) decided increase in efficiency—the patient, having formerly led a semi-invalid existence, is now able to do her own work.

There are no symptoms referable to the gastro-intestinal tract except an occasional loss of appetite and slight distress in the epigastrium, which is not of sufficient severity to interfere with the performance of her duties. May, 1915: Since the last note was made the patient has continued in excellent health. Speaking most conservatively, one may say that in this case a 75 per cent restoration of efficiency has been gained as the result of colectomy. This may, therefore, without undue optimism, be counted as a good result.

CASE 3. Gynecologic No. 3,689. The patient was admitted to the hospital on April 10, 1911. She is forty-six years of age, married, and has two children. She was operated upon in 1902 for extensive pelvic inflammatory disease, the tubes, uterus, and ovaries being removed. At the time of her discharge from the hospital she had pain over the upper part of the abdomen after eating. She returned one month later still complaining of the pain in the right side of the abdomen. Four years later pain appeared on taking food, and this was followed by nausea and vomiting. After four weeks' medical treatment in the hospital she was apparently relieved. Two months later she had a serious fall from a considerable height. Since then she has had more or less continuous abdominal pain, headache, backache, nausea, vomiting, and general nervousness. She was admitted to the medical wards of the University Hospital three or four times for the treatment of gastric distress and obstructive constipation.

After several months of ineffectual medical treatment she was referred to the gynecologic ward. An incision was made midway between the symphisis and the umbilicus. The transverse colon was found to be adherent to the lower angle of the wound and the stomach was likewise anchored through this attachment of the transverse colon, and the ad-

hesions were freed. The patient was placed in the Trendelenburg position, and the hammock type of operation suggested by Coffey was performed. She made a satisfactory convalescence. A mild laxative was administered—just sufficient to move the bowels. A skiagram made subsequent to the operation showed the stomach to be in good position above the umbilicus. The patient was subsequently seen from time to time. She has made a most satisfactory improvement.

She was readmitted to the hospital April 10, 1911, five years after the last operation, after having had a heavy fall, a recurrence of the previous symptoms taking place. The patient was perfectly well after her operation; the appetite was good, food being retained, and she gained steadily in weight. No gastric symptoms appeared for one and one-half years. Following a severe strain there was a gradual return of her former symptoms—loss of appetite, a heavy sensation in the epigastrium, a feeling of fulness and gaseous eructation after eating, vomiting, and acute general gastric pain. Symptoms of obstruction, more or less paroxysmal in character, were present. The bowels now move only on using drastic cathartics. The patient has lost rapidly in weight, and has fallen into a very wretched state. An X-ray examination showed the colon again in the position of exaggerated ptosis.

At operation the colon was removed, and an anastomosis of the ileum into the sigmoid flexure made. The duodenum was now found to be greatly dilated, being at least twice its normal size; its walls were very thin and attenuated. Because of the more or less constant vomiting from which the patient has suffered previous to her entrance to the hospital a gastro-enterostomy was deemed advisable. The operation was followed by considerable shock, and for a few days the patient was in a critical condition. After this, however, she made a rapid convalescence, and showed the most satisfactory immediate improvement as the result of the operation. She began to take food at once, her appetite became normal, and there was a rapid increase in weight. For fifteen months the patient remained in perfect health, when she developed a persistent diarrhœa that was for a time very obstinate but was finally controlled by medical treatment.

November 2, 1913: Diarrhœa ceased eight months ago. The bowels now move three or four times daily, usually after eating. The movements are now partially formed, and there has been no sign of constipation at any time. She complains of pain immediately after eating, beginning in the epigastrium and extending over the entire abdomen. There is a good deal of belching, and she occasionally has attacks of vomiting immediately after eating. There is no hæmatemesis. During the stage of diarrhœa she weighed 88 pounds; she now weighs 100 pounds. The appetite is poor.

September, 1915: The patient has remained about the same since the last note was made. The intestinal function continues to be satisfactory. Although the patient's efficiency is greater than it was previous to her last operation, and although, unquestionably, she has improved very markedly since that time, she is still very neurotic. Certainly the constipation has been completely relieved, she has gained in weight, and her present condition is better than it has been for several years. Considering the temperamental equation in this patient, she is as well as she probably ever will be.

Case 4. Gynecologic No. 3,938. Colored woman, aged 35. Admitted to the hospital November 1, 1911. The patient was operated upon before the Clinical Congress in 1911. She dates the onset of almost complete invalidism to a period thirteen years ago, when she had a miscarriage. At the time of her entrance to the University Hospital she was suffering from severe headaches. So far as she can remember she has always suffered from constipation, which grew worse after the birth of a child following several miscarriages, and has become practically obstructive. Although she does not vomit, she is constantly raising mucus. Occasionally she takes mustard water to relieve her. Regurgitation of food and eructation of gas follow every meal. No flatus ever escapes, and she is unable to have a natural defæcation, but must resort to the most drastic purgatives in order to effect a bowel evacuation. The patient is a sparely built woman, and has the appearance of being very ill. In view of the prolonged history of this case and the increasing obstructive character of the constipation an operation was considered advisable.

November 10, 1910: Cœliotomy was performed. The colon had practically become a pelvic organ. It was dilated, but otherwise appeared to be normal. There was no hepatic flexure. The transverse colon was of normal length, passing obliquely upward from the cæcum to the splenic flexure. After freeing the adhesions it was found that the stomach was pulled down and was somewhat dilated. The entire colon possessed a mesentery, and could be delivered through the incision. As the colon was found to be redundant, dilated, and markedly dislocated, a colectomy was performed since it was impossible, in a flat, retracted abdomen, to replace it to even an approximately normal position with any hope of having it functionate normally. The ileum was connected with the lower portion of the sigmoid flexure by a lateral anastomosis.

The patient left the operating table with a pulse of 90, but within three hours symptoms of severe shock appeared. The pulse remained between 120 and 130 for two days, after which it fell to the normal and the patient made a satisfactory recovery. On the third day the bowels moved twice spontaneously, and subsequently, for a day or more, three or four times. The stools then increased in number until the twelfth day, when she had only one or two movements. There was no undue thirst, her appetite improved rapidly, and on the fourteenth day after operation, she took the ordinary ward diet without discomfort. All her neurasthenic symptoms disappeared.

February 11, 1912: Three months subsequent to operation the patient returned to the hospital with the statement that she felt perfectly well. There was no irritability of the bladder and the bowels moved daily. She can eat all food without distress, sleeps well, and does her entire housework. The pain in her back and the distress in the abdomen have disappeared entirely, and she is steadily gaining in weight. She has taken no laxative or purgative since she left the hospital.

October 20, 1913: The patient is doing her housework, and is apparently in the best of health. She states that her health is better than it has been for years. From her former weight of 115 pounds she has gained until she now weighs 136 pounds. She sleeps soundly and has a good appetite. She has two well-formed movements daily without pain, and never takes a laxative. Says she is now perfectly well and happy, which she never was before.

August, 1915: The patient has not been seen since the last note was made but a neighbor, recently admitted to the hospital, declares she is quite well.

Everything considered this may be counted as an ideal result.

Case 5. Gynecologic No. 4,192. The patient was admitted to the hospital May 4, 1912. She is thirty-six years old, has been married seven years, and has one child; labor difficult. As far back as she can remember she has been constipated, requiring the use of cathartics frequently. About fifteen years ago she began to have severe occipital headaches, which forced her to give up her regular work while the attack lasted. At these times she noticed that the constipation was more stubborn, and that the headaches bore a distinct relationship to the condition of the bowels — that as constipation produced the headache, an evacuation would relieve the pain. She has had indigestion for years, expressed by a fullness in the epigastrium and belching. During the past year the ingestion of solid food has caused pain in the epigastrium. This pain comes on immediately after meals, and is often severe enough to cause her to double up; it is usually relieved by hot and cold applications. She has had attacks of vomiting, the vomitus containing food remnants of the day before. She suffers greatly from sour stomach and belching. Cathartics, no matter how drastic, have little or no effect beyond producing pain in the left iliac region. Relief is obtained only from a large enema. As long as fourteen days have elapsed without a bowel movement. She is never troubled with diarrhœa. She has a constant feeling of depression, and has lost eleven pounds in weight during the last month. Although her appetite is not impaired, she refrains from taking solid food because of the pain that follows its use. Aside from a frequent desire to urinate when standing, no symptoms referable to the kidney or bladder are present.

May 7, 1912: Operation was decided on because of the exaggerated degree of coloptosis and the increasing degree of obstruction, loss of weight, and marked invalidism of this patient. A median incision was made. The colon was found to be practically a pelvic organ. The gall-bladder and stomach were normal, so far as any demonstrable lesion was concerned. The colon was of enormous size, being not only greatly increased in length, but in diameter as well. Its walls were markedly attenuated. There was no flexure in the hepatic region. The colon was excised, and a lateral anastomosis between the ileum and sigmoid was effected. The sigmoid flexure was redundant, and to prevent sagging and possible obstruction of the anastomotic junction the upper portion of the sigmoid at the point of excision was suspended from the parietal peritoneum and covered with a cuff of omentum. The operation was followed by a stormy convalescence for three days, during which there were symptoms of peritonitis, and from which she gradually recovered.

June 11, 1912: Patient discharged, apparently in good health. The bowels move easily and the stools are well-formed. Occasionally a simple enema or a glycerin suppository is necessary. During her convalescence the occurrence of sharp, cramp-like pains gave rise to a fear of possible obstruction. On September 10, 1912, the patient reports from the country, where she has gone for the summer, as follows: Until the middle of August she says she gained steadily, eating well, and digesting food without difficulty. There is no strain on defæcation. She has taken no laxative or purgative recently. Has occasional pain, but this is not severe — usually only an uncomfortable feeling. She is slightly nauseated at times, but never vomits. Although gaining speedily in strength, there has been no increase in weight. She still has headaches, but they are not so severe as formerly. Occasional attacks of irritability of the bladder occur.

December 10, 1912: Since the last report the patient has made no progress, and her symptoms have not improved sufficiently to permit this case to be regarded as a satisfactory result.

February 1, 1913: No further improvement has taken place, and the patient will return to the hospital for closer study. Eating causes serious distress, and she has intense tympanites. There are decided signs of obstruction, due, it is believed, to intestinal adhesions.

April 30, 1913: Since the last note was made the patient has become progressively worse. For a time she had severe diarrhœa, but now the stools apparently collect in the lower bowel, and the abdomen becomes greatly distended. She has paroxysmal pains, which are relieved only by the evacuation of a large stool. Defæcation is accompanied by great pain, and the patient has fallen into her old nervous state again. She has no appetite, and for the past two months has confined herself to a diet of buttermilk. The pain is situated on the left side, over the site of anastomosis.

May 2, 1913: a second operation was performed. The abdomen was opened along the line of the old incision. The anastomotic opening between the

ileum and the sigmoid was found to be patulous, easily admitting two fingers. A very interesting condition, however, had developed in the blind end of the ileum, beyond the point of anastomosis. This had become greatly distended, forming a pouch that contained at least six ounces of fluid. It had swung upward upon itself, and had become attached to the ileum just above the point of anastomosis, and a pathologic communication between this pouch and the ileum had formed. The operation consisted in releasing the adhesions between the pouch and the ileum and in closing the fistula in the ileum. The pouch was next resected close to the point of anastomosis, and completely obliterated this cloacal formation. There was no evidence of adhesions in any part of the abdominal cavity.

May 18, 1913: Following the operation the patient made a very satisfactory convalescence. The bowels are moving spontaneously, and she is free from any abdominal symptoms.

October 1, 1913: Since the operation the patient has done moderately well. She is extremely neurotic, and complains of pain more or less over the entire body. On the whole, however, there has apparently been a very decided improvement over the condition preceding the last operation. Her bowels move once or twice daily without the use of drugs. She has no nausea or vomiting. Concerning her gastro-intestinal state she says: "My bowels act real well. My appetite is good, but I still have considerable gas."

Summarizing the results obtained in this case one may say that the gastro-intestinal condition has been improved. The constipation since the last operation has been relieved. The pouching of the blind end of the ileum at the point of anastomosis unquestionably argues in favor of an end-to-end rather than a lateral anastomosis. As to any marked change in the woman's neurotic condition, there has apparently been some improvement. In brief, therefore, one may say that constipation has been relieved, the efficiency of the patient has been increased, and the neurosis is considerably better. Pathologic examination of the resected portion of the blind end of the ileum shows it to be the seat of a chronic enteritis.

Case 6. Gynecologic No. 4,216. The patient is a married woman aged thirty-six years. She has been married six years and has two children, the youngest two years old. Labors very difficult — instrumental. As far back as she can remember she has had obstinate constipation, requiring the use of powerful cathartics as well as copious enemata to produce evacuation. At times she has taken large doses of castor oil without effect. From time to time attacks of diarrhœa have occurred. Frequently, during the last six months, she has had attacks of unusually severe constipation, followed by diarrhœa and persistent vomiting for many hours, with agonizing occipital headaches. She suffers almost constantly with abdominal distention, which is often so exaggerated that the colonic outlines can easily be made out. At such times there is severe colicky pain along the course of the colon. Following the birth of her first child these symptoms all became greatly exaggerated. After the second child was born the obstructive symptoms became still more prominent. She is extremely nervous and irritable, and greatly depressed because she feels unable to give her children proper care. The occipital headaches are very severe, but are usually relieved by thorough evacuation of the bowels. For the last year she has lost weight and strength rapidly. Beyond slight heartburn and vomiting, there are no symptoms referable to the stomach. She states that the constipation was less marked during pregnancy.

May 6, 1912: Operation. A median incision was made. The colon, especially the cæcum and the ascending and transverse portions, was greatly dilated. There was complete disappearance of the hepatic flexure, and although the splenic flexure was present, it was somewhat loosely attached. The cæcum was redundant. The stomach, gallbladder, and rectum were normal. Colectomy, with lateral ileosigmoidal anastomosis was performed. Symptoms of post-operative obstruction which followed were relieved by castor oil. From this time on the patient made a satisfactory convalescence, small glycerin enemata being given daily to clear the bowel. She was discharged June 7, 1912, the bowels moving easily after a small glycerin enema — in fact, they show a tendency to be a little loose. Pain has entirely disappeared, her appetite is good, and the patient has gained rapidly in strength. Her nervous condition is markedly improved.

After leaving the hospital the patient gained steadily in weight, this gain amounting to 24 pounds. She continued to suffer from headaches, but the attacks were less severe and more infrequent. The bowels moved daily without the use of purgatives or laxatives, and she felt better in many ways than she has for years.

September, 1915: About six months after operation the patient dropped back into her former condition of extreme constipation. It is now quite impossible for her to effect a movement without the use of a large enema. There is considerable paroxysmal pain at the site of the ileosigmoidostomy, indicating partial obstruction. The headaches are as severe as formerly, but the indigestion is somewhat better.

November 26, 1915: Patient writes, "I am no better — no worse — than when I last saw you. I struggle along from day to day, using both enemata and medicine to keep the bowels open. I have a great deal of rheumatism, and for the past few months have had almost constant headache accompanied with dizziness, and when I lie down the dizziness makes me feel as though I were fainting. Even the change of position while lying down seems to bring the same feeling."

It will be seen from this last communication that

the patient is no better and while perhaps her present condition is no worse, the operation can be said not to have brought any permanent benefit.

CASE 7. Gynecologic No. 4,300. The patient is a married woman, aged thirty-eight years. She has had no children, but one miscarriage five years ago. During the last two years she has had several convulsive attacks at the menstrual period. She is very apprehensive about these attacks and hopes the ovaries may be removed to relieve them. The patient has always been obstinately constipated, and in an effort to produce a satisfactory evacuation has taken castor oil, followed by "Pluto Water" and enemata. The constipation became worse after puberty. In June, 1910, she was operated upon for appendicitis, and for a time there was some improvement in the constipation, but during the last year the constipation has grown worse, but at no time has there been diarrhœa. For years she has passed large quantities of mucus, which occasionally has been blood-tinged. During this time she has had constant pain in the left hypochondrium. This pain is at present continuous, but sharp exacerbations with sudden abdominal distention occur. She often has a "feeling of a ball at the site of the pain." This is not affected by the taking of food, but is brought on by stooping and by taking laxatives. It is relieved by a thorough evacuation. She has enormous bowel movements. Her physician states that after a thorough purgation an enema may bring away a large quantity of fæcal matter. There is a sensation as of active peristaltic movements along the course of the transverse colon, stopping suddenly at the splenic flexure. When marked abdominal distention occurs, nausea and vomiting are likewise present. During the last three months three such attacks have occurred, no gastric symptoms whatever being present. There are no symptoms referable to the gall-bladder.

August 12, 1912: Operation. A median incision was made. The topography of the colon corresponds to the X-ray negative. The splenic flexure is well fixed; the hepatic flexure is only partially fixed, and the bowel assumes a more or less straight course from the cæcum to the splenic flexure. The cæcum is very large and quite movable and has a long mesentery. The ileum is not only greatly thickened, but its caliber is markedly increased. The operation consisted in excising the colon to within about four inches of the splenic flexure, including the transverse colon, ascending colon, and six inches of the ileum. Lateral anastomosis between the ileum and the sigmoid flexure was effected. The uterus was found to be slightly enlarged, and the ovaries and tubes were normal. In spite of the patient's urgent request, the ovaries were not removed.

August 31, 1912: Since the operation the bowels have moved three times a day without the use of cathartics. Today the movements are fully formed for the first time. There is no undue thirst. The taking of food always precipitates a movement of the bowels. The general condition and appetite are good.

September 30, 1912: The patient was discharged from the hospital. For the last week or ten days she has complained of pain under the left costal margin. This pain lasts only a few seconds, some tenderness always remaining. There is no elevation of temperature. The bowels move regularly three times a day, and the stools are partially formed. One dram of castor oil is sufficient to produce free evacuations. Her general condition is excellent.

November 2, 1912: Her physician states that she has had one attack of obstinate constipation, with persistent nausea and vomiting, similar to the attacks previous to operation, but that he believes her condition is improved.

February 15, 1913: The bowels move easily after a small dose of paraffin. There is no further intestinal stasis. An X-ray picture shows the site of anastomosis to be patulous, and there is no damming-back of the bismuth or fæcal matter in the descending colon — the portion left after the operation. The patient has had another convulsive attack at the menstrual period, which has greatly depressed her, and both she and her husband insist that a second operation for the removal of the ovaries be performed.

September 10, 1913: Since the last note was made the patient has had no trouble with the intestinal function. One or two movements occur daily. She still has pain under the left costal margin. Another menstrual epileptic seizure has occurred. At the urgent request of patient and husband an ovariotomy was done. The result of the colectomy was found to be perfect; there were no adhesions, and only a slight dilatation of the distal end of the anastomosed ileum, which was invaginated for fear of further dilatation taking place. The patient has been relieved of constipation.

November 15, 1915: Since the last note was made the patient's physician reports that she has continued to suffer from pain in the upper portion of the abdomen. No convulsive attack has occurred for the last year. The function of the intestine is moderately good, although occasionally, as the result of an indiscretion in diet, she has attacks of constipation, attended with nausea, vomiting, and severe headache, which are, however, relieved by catharsis. During this time she has tenderness over the area where the cæcum formerly was. On account of the gastric disturbance it is necessary for her to adopt a light diet. Summarizing, her physician considers her better than she was before the removal of the colon, but the patient is, nevertheless, far from well.

CASE 8. Gynecologic No. 4,801. The patient, aged twenty-eight years, was admitted to the hospital July 8, 1913. She has been married five years. Has had one miscarriage in the third month. As far back as her memory goes she has always been obstinately constipated, the obstipation being much worse since her marriage. Since her present illness

began she has steadily lost weight, falling from 150 to 115 pounds. She suffers constantly from occipital headaches, sleep being disturbed continually by intestinal pains and tympanites. The appetite is capricious — some days, good; on others, bad. Following a meal the abdomen becomes markedly tympanitic — feels full and distended. Three operations have been performed in another hospital as follows: As a result of increasing discomfort and serious constipation an appendectomy was done three years ago, but gave no relief. A second operation was performed one year ago, but this consisted merely of an exploratory laparotomy. A few calcareous glands were found in the mesentery, and these were removed. Again there was no relief. On account of the obstinate constipation a lateral anastomosis between the sigmoid and ileum was made five months ago. For six weeks subsequent to this operation there was marked relief, but since that time all her old symptoms have returned in an exaggerated degree. Paroxysmal pain, attended with obstinate vomiting, is of almost daily occurrence. The bowel movements are liquid, and she suffers from severe tympanites. Because of the obstinate nausea and vomiting and the paroxysmal pain a fourth operation was deemed absolutely necessary.

Operation July 10, 1913: An incision was made in the median line and an anastomosis between ileum and sigmoid effected. The colon was bound to be greatly distended. There were slight adhesions, none being of an obstructive character. The entire difficulty, therefore, seemed to be due to an obstructive fæcal stasis of the colon. The ileum was ligated and occluded close to the point of anastomosis with the sigmoid, so that no pouch could possibly form. The remaining portion of the ileum up to the cæcum — about eight inches — was removed, along with the colon around to the splenic flexure. The patient made a very satisfactory recovery, the bowels moving daily during the time she was in the hospital. For a short time subsequent to the operation she continued to do well. The following note from her physician was received October 3, 1913: "Mrs. T. returned home in good shape, and continued to do well, with the exception of a little soreness in her abdomen for about ten days to two weeks. She then had a severe attack of colic. A week later she had a similar attack. Pain was intense — required one-half to three-quarters grain of morphine to control it. Coincident with these attacks there was swelling in the left side of the abdomen, which was quite sore and painful on pressure. I took this to be an impaction of the sigmoid, and instructed the nurse to give several enemata. Considerable hard fæcal matter was washed out, and this gave immediate relief. I may say, however, that, prior to this attack, she had daily liquid movements. She has had two or three attacks since, but they have not been so severe. I have instructed her to take an enema every day and wash the bowel out completely. I am not sure whether this is the cause of her trouble, or whether she may have some little obstruction due to some adhesion, but the fact that she gets relief when the bowel is cleared out leads me to believe that the whole trouble is due to impaction of the blind end of the sigmoid."

Since the last note was made the patient returned with serious obstructive symptoms necessitating another operation. Extensive adhesions had formed between the loops of the small intestine. One area was tightly constricted, necessitating excision of a few inches. The descending colon was removed. The anastomosis between sigmoid and ileum was released, and placed low down in the pelvis. After this operation the patient gained rapidly, there being an increase of thirty-five pounds in weight in six months. The general condition has greatly improved.

November, 1915: Subsequent to the last note the old symptoms recurred with increased severity. An X-ray examination shows the ileum to be so greatly dilated that it simulates the large intestine in caliber. The patient has again lost weight, and is in a very wretched state, with more and more threatening symptoms.

Case 9. Gynecologic No. 5,171. Patient is a single woman, thirty-seven years of age. Admitted to hospital March 25, 1914. The present complaint began four years ago, when she had what was said to be intestinal indigestion. For the succeeding two years, six or seven attacks occurred, with sharp, cramplike pain attended with nausea. Since then these attacks have become more and more frequent, and for the last six months the patient has been bedridden. Whenever she is on her feet an attack comes on, beginning with severe pain low down in the right side of the abdomen, accompanied by nausea. At such times it is extremely difficult to relieve the constipation, large doses of castor oil and other drastic purgatives being required. An enema of any quantity sets up intense paroxysmal pain. Up to two and one-half years ago constipation was of moderate degree, but since then it has grown progressively worse, and is now very stubborn. Purgatives in large quantities and frequently repeated must be taken to effect an evacuation. At times she has severe nausea, but no vomiting. The patient suffers greatly from headaches, which are relieved by a free movement of the bowels. She passes no mucus or blood. There has been a progressive loss of weight and strength during the past year. An X-ray examination showed intense colonic stasis with a large, dilated cæcum.

*Operation:* A long median incision was made. A few frail adhesions were found in the pelvis. The tubes and ovaries were normal. The cæcum was of enormous size, and freely movable, with hypertrophy of the terminal portion of the ileum. There was no fixation of the hepatic flexure. The sigmoid was normal in caliber although somewhat redundant. The gall-bladder and stomach were normal. The operation consisted of the excision of the terminal

ileum, ascending and half of the transverse colon. The omentum was not sacrificed. The stump of the transverse mesocolon was enveloped with the omentum, and a side-to-side anastomosis between the ileum and the lower end of the sigmoid effected.

Post-operative pneumonia developed, affecting the lower right lobe. There was severe pain in the abdomen, but no abdominal distention and but little nausea. The bowels moved easily through the tube. The patient continued to suffer greatly from the pneumonia, which gradually cleared up, but was followed by pleurisy and empyema. Aspiration of the pleural cavity was performed, followed by a small incision, with drainage and gradual relief. Two weeks later a mass formed in the right side, at the site of the mesentery of the ascending colon. The indurated area was opened under gas anæsthesia. No pus was found. The temperature continued irregular for several days but this condition gradually subsided. Patient did not, however, recover sufficiently to leave the hospital for two and one-half months. During this time the bowels moved with great regularity and without difficulty.

Subsequent to the patient's return home a small fistula developed at the site of the incision into the indurated area — a fæcal fistula of small caliber, which remained open for a month and then closed spontaneously. Since then the patient has gradually gotten about. She has gained in weight, and in many respects is markedly improved.

October 1, 1915: For the past six months the patient has gained greatly in strength and in general health. She looks very much better, so far as physical appearance goes, but reports that the constipation is gradually increasing, requiring the use of mild laxatives. Paraffin oil is usually sufficient to cause an evacuation, but it is occasionally necessary for her to resort to an enema in order to clear the colon. Her physical condition has improved sufficiently to permit her to return to work.

According to her own estimate, she is very markedly improved, and has been relieved of all her old intestinal pains and to a large extent of her headaches.

The results in this case show what has been noted in others of the series; namely, a temporary relief of constipation with a gradual return of symptoms.

Case 10. Gynecologic No. 4,999. The patient is a single woman, aged twenty-seven. She has suffered from constipation as long as she can remember, but this has become markedly increased since the insertion of a Wylie drain, removal of the appendix, and suspension of the uterus were done two years ago in her home city. Since then drugs have proved almost ineffectual, and one or two enemata are required daily. With the onset of the severe constipation there have been frequent urination and constant irritability of the bladder, relief usually following thorough evacuation of the bowel by an enema. There is more or less constant pain in the lumbar regions, described as a heaviness or bearing-down sensation. The patient suffers of late from intense headaches, which almost totally incapacitate her. The constipation has now reached the stage where it is obstructive in character, and her physician feels that immediate operation must be performed to relieve her.

The X-ray examination revealed great dilatation of the large bowel, particularly in the cæcal region. The cause assigned by the roentgenologist for this condition was the presence of adhesions of the sigmoid in the pelvis.

During several days' stay in the hospital, under observation, every effort was made to correct the obstructive constipation by regulated diet and the use of purgatives, but these were of no avail. As a rule the bowels could be evacuated only by placing the patient in the elevated hip posture, and using a voluminous enema.

*Operation*, December 8, 1913: A median incision was made. Examination of the pelvic organs, gall-bladder, and stomach showed them to be normal. The colon was greatly dilated and thin-walled, and there was great redundancy of the sigmoid flexure, but no definite point of obstruction. Several small, veil-like adhesions around the sigmoid were broken up. On account of the patient's frail condition, and as the cæcum lay in direct contact with the sigmoid in the pelvis, an anastomosis was made between these two portions of the large bowel. In order to obstruct the current of the intestinal flow the ascending colon at the hepatic flexure was doubly ligated and separated, with infolding of the two stumps. A rectal tube was passed into the sigmoid and through the anastomosis into the cæcum. For several hours immediately following the operation there was severe shock. Under appropriate treatment this subsided, although the pulse remained rapid for some days. The constipation and distention appeared to be decidedly better for a few days, but reappeared and were as bad or even worse than before the operation. It was impossible to secure a thorough evacuation of the bowels. A proctoscopic examination showed that the opening between the sigmoid and the cæcum was patulous. After several days' further observation it was found that this form of anastomosis was absolutely valueless, as the fæcal current failed to flow satisfactorily from the cæcum into the sigmoid.

As the patient was growing progressively worse, it was found imperative to perform a second operation, at which the ileum was anastomosed into the sigmoid, and the ascending colon and a portion of the transverse colon, at the point where it had previously been occluded, were removed.

Subsequent to this the patient made a very satisfactory recovery, and the bowels immediately assumed their normal function, a satisfactory evacuation following the use of a small amount of liquid paraffin. There was very little abdominal dis-

tention and no pain was present. The appetite immediately became better, and the patient gained rapidly in weight.

March 27, 1914: Since the patient left the hospital she writes that she is troubled with gaseous distention, but that no flatus escapes. She is gaining in weight, and is feeling better than she has for two years. Has had one or two attacks of headache, but these have been of much milder degree. Altogether, she is markedly improved, and feels better each day. A small amount of orange-juice and liquid paraffin are sufficient to cause a movement daily. Subsequent to this, the patient returned to her work as a bookkeeper.

November, 1915: Since the last note the patient has drifted back into her old state and now the constipation is as bad as ever. She is able to work only half of the day, the remainder being given over to various manœuvres to secure a fæcal evacuation.

The first operation (anastomosis between the cæcum and sigmoid), even though the ascending colon was blocked, proved absolutely futile. The intestines could not be made to move through this reverse channel. The complete failure in this case would prohibit any attempt at this type of operation again. In my opinion such an operation is inadvisable, for the fæcal current will not follow this course if, as in this case, the intestine is blocked or it is left patulous above, for the ascending colon tends to drive the fæcal matter upward, and not downward. The case shows the tendency observed in others of our series; viz., a period of a few months of improvement followed by a recurrence of the intense constipation.

Case 11. Gynecologic No. 5,152. The patient was a married woman, twenty-six years of age. She was admitted to the hospital, March 16, 1914. She has never had any serious illness. After the birth of her baby, three and one-half years ago, she began to have rectal pain, with constipation. From this time on she had to use drastic purgatives. During the summer months her condition improved, but as soon as cold weather came on she became severely constipated, passing large quantities of mucus. She may go as long as ten days passing nothing but mucus, and then, as the result of purgatives, a large evacuation will occur. Mucus is passed more or less constantly, and large quantities of gas are eructated. There is tenderness and soreness over the colonic outlines. She has been in the hands of an excellent physician, who placed her on a careful diet, and prescribed irrigations of the colon, but notwithstanding this treatment her condition has steadily grown worse. She has lost at least twenty pounds in weight.

An X-ray examination shows dilatation of the ascending colon to the middle of the transverse portion. From this point the caliber of the intestine appears to be normal.

Operation was performed three days after admission to the hospital, March 19, 1914. A partial colectomy was done. The cæcum was a large, mobile sac, and along with the ascending colon was greatly dilated. The terminal portion of the ileum was greatly distended and hypertrophied. The transverse colon was dilated to a point at about its middle, where it decreased to the normal size. Back of this point the intestinal wall was thin and parchment-like in appearance. The sigmoid was normal in length and in position. The ascending and transverse colon, to the normal portion of the bowel, was removed, and the ileum was connected with the lower end of the sigmoid by a side-to-side anastomosis. The patient's convalescence was uneventful. Constipation immediately disappeared, and improvement set in at once.

September 21, 1914: The patient has gained twelve pounds in weight, and her health has been splendid until two weeks ago. The bowels have been regular, requiring no laxative, and moving twice daily. There is no pain. Three days ago she began to have diarrhœa. Under starch-water and bismuth injections the condition improved and the bowels returned to the normal.

November 8, 1915: Since the last note was made, the patient has been in fine health. The bowels have moved regularly. The appetite is good. She has gained several pounds over her highest normal weight preceding the operation, and in every way the operation appears to have been highly successful. There has been a slight recurrence of diarrhœa similar in character to that previously noted. The same plan of treatment was again advised.

Case 12. The patient, a single woman, aged twenty-one years, was seen in consultation with a surgical colleague in a neighboring city on April 25, 1914. Her history was as follows:

Two years previously the patient had been operated upon for chronic appendicitis. The attack began with pain in the umbilical region, colicky in character, and located in the right iliac fossa. It was attended with nausea, but no vomiting. She was operated upon the following day, and an intussusception of the ascending colon and ileum was found. These segments were invaginated four inches into the ascending colon. There was a rent in the omentum, through which the ileum protruded. The patient made an uneventful recovery. A second attack occurred March 12, 1914. It began with diffuse colicky pain in the abdomen, followed by a chill, nausea, and vomiting. The temperature rose to 101° F. and the pulse was 116. She was operated upon on March 14, 1914, when an acute obstruction of the large intestine was found, due to adhesions along the ascending and transverse colons. The adhesions were released. Convalescence was uneventful until April 13, when her temperature rose to 102°. Pain again appeared in the abdomen, with vomiting and distention, and the bowels were obstinately constipated. This condition continued until the 17th of the month, when she was again operated on for obstruction of the bowel. Again an intussusception of the ileum had

occurred into the head of the cæcum. The adhesions were released as before, and convalescence was uninterrupted until April 25, when the symptoms recurred. The patient was operated upon again, and a lateral anastomosis between the ileum and the transverse colon was made. The condition of the patient did not improve. Convalescence was disturbed, and three days later the pain returned in all of its severity, and the bowels became obstinately constipated. Nausea, vomiting, and great distention occurred. A partial evacuation took place, but with only temporary relief of the symptoms.

In consultation with my surgical colleague, we decided that it would be useless to consider any other operation than removal of the colon and anastomosis of the ileum with the transverse colon beyond the point of adhesions. The operation was performed under nitrous oxide anæsthesia. Convalescence was good, but she continued to have a slight elevation of temperature until early in May.

Subsequent to this her condition rapidly improved and from the time of operation up to the present, November 16, 1915, the bowels have moved with marked regularity. Occasionally a slight attack of diarrhœa occurs. Her digestion is normal. She has resumed her work, and feels perfectly well.

The history of this case is included in this series not as an example of constipation, but as one of definite obstruction, in which the anastomosis of the ileum into the transverse colon was performed with the removal of the ascending and middle portion of the colon, followed by a very satisfactory result so far as intestinal evacuation is concerned.

## SUMMARY

1. In only 6 of the 12 cases operated on may one consider the result as entirely satisfactory.

2. In all cases there has been great improvement in the constipation for a time, to be followed at variable intervals in four by a gradual recurrence of the constipation. In some cases this has not been so severe as formerly, whereas in others it is quite as intense. X-ray examinations in three cases showed in two decided dilatation of the ileum to a size closely resembling that of the colon.

3. In none of these cases has there been diarrhœa of long standing, and none that was not controlled by simple medicinal measures.

4. In none of the cases has there been undue thirst.

5. In six cases there has been marked improvement in nutrition. In the remainder there was no visible effects so far as physical improvement is concerned.

As a final summary of these cases, we feel that total removal of the colon is justifiable only in severe cases of obstructive constipation. From our experience in the foregoing cases we are of the opinion that a less radical procedure must be employed, and incline to the limitation of the colectomy to the ascending and the middle of the transverse colon, with a lateral anastomosis of the ileum into the transverse colon. In this way the omentum is preserved, and there is far less traumatism to the mesentery, with its very important sympathetic nervous system. From our experience in one case alluded to in this series, and in two or three others in our case records, we are convinced that any form of anastomosis between different segments of the colon or between the cæcum and sigmoid flexure, with the expectation of diverting the fæcal current into this new channel, will almost invariably be doomed to failure.

Finally, we believe that the one valuable point gained in the study of our series of cases of colectomy is that the ileum will not uniformly assume the vicarious function of the colon, and that the backward pressure from the colon through the anastomotic opening, when it is low down, in a definite proportion of cases causes dilatation and permanent impairment of the ileum.

If a technique can be devised that will prevent the reflux into the ileum it will serve a splendid purpose in obviating one of the objections to an extensive colectomy. In severe cases of obstructive constipation I believe our cases demonstrate that it may be a very efficacious operation if carefully restricted and may be added to our surgical therapeutic list. The immediate danger of the operation and the serious sequellæ that may follow weeks or months later make it, however, too hazardous to extend it into the wider fields so ardently advocated by Lane and his enthusiastic followers. It may be efficacious but it possesses no miraculous function.

# VARIED TOPICS CONCERNING THE SURGERY OF INFANTS AND SMALL CHILDREN [1]

By COLEMAN G. BUFORD, M.D., F.A.C.S., Chicago

THE scarcity of infants and young children as patients in any one general surgical service impressed me many years ago. It is generally assumed that the surgical service in a children's hospital is limited in the amount and variety of work. This is not necessarily true. Children's hospitals are rapidly being brought to high standards of efficiency which will soon make them important centers of medical education and research. I am convinced that no more fertile field exists for research work and human benefaction than that of general pediatric surgery. My greatest inspiration and aid has come through my visits to some of you, when I have learned how you viewed and what you were doing for afflictions in which I was especially interested. I am therefore prompted to review briefly some of my experiences and views concerning a few of the more common afflictions which have come into my service in the Children's Memorial Hospital.

Young children should not be brought into hospitals for diagnostic work if it can be thoroughly done at the office, home, or in the Out-Patients Department. This especially applies to nursing babies; inanitions and contagions are too often the penalty. A baby when upon a dressing or operating table should always have a hand of an attendant resting upon it. I have seen two babies fall to the floor while adults stood against the table on either side amused at the giving of this precaution.

Both minor and major surgical work in early infancy should be deferred if this can be safely done; recovery rates from both increase in the first year with each month of life. The terrible mortality from major surgical work done in early infancy has never been properly impressed upon the profession. This high mortality is due —

1. To lack of equipment and preparedness to do infant surgery.

2. To hæmorrhage, which babies do not withstand. Our speed in operating and our instruments for stopping hæmorrhage are the same as those for adults. In infants we must regard bleeding points which in adult surgery we would pay no attention to. About 8 per cent of the adult bodily weight is blood, while in the newborn it is about 5 per cent. In adults (1) when 5 of this 8 per cent is lost the patient dies. Should a baby lose the same percentage it would be totally exsanguinated. The relative amount of blood lost by babies during operations is usually underestimated. They go to their beds and may deceive one by the quietness of their slumber and their rosy appearance. Continued watching will too often show good color of the skin which frequently alternates with extreme pallor about the lips and nose and is evidence of grave danger. When such pallors are seen the surgeons must give serious consideration to the immediate need of blood and do direct or indirect transfusion. Hypodermoclysis and transfusion with normal salt solution do not often satisfy the demand in young children and are usually given in excessive amounts, causing hydræmia and greatly diminishing coagulability. I consider both a waste of time and harmful to children who have developed acquired hæmophilia from continued oozing from small wounds, which is a frequent occurrence.

Most of the transfusion appliances are too large for introduction into infant vessels. If they must be used in emergency it is best to select the external jugular; if this is found too small, an attempt may be made to use the internal jugular or the axillary vein. Large glass aspirating syringes may be used as substitutes for the more complicated transfusion appliances. A 20 ccm. syringe containing 2 ccm. of 10 per cent sodium citrate may be filled with the blood of the donor and easily injected into the veins of children. Dr. Bernheim (2) lately devised a syringe

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which aspirates blood directly from the donor and with pressure on the piston injects it immediately into the recipient. My colleague, Dr. Henry Helmholz (3), has recently suggested the use of the longitudinal sinus for infant transfusion when the anterior fontanelle is open.

3. Shock is not the important factor in infant surgery as supposed. That which is usually termed shock is often the result of hæmorrhage.

4. Inanition which frequently precedes surgical needs or develops in the hospital is often uncontrollable. An expert in infant feeding should be in attendance upon every one of such patients.

5. Unexpected contagion will always be a complication in infant surgery.

6. Wound infection is far more damaging to infants and young children than to the average patient in later life. Infants are not especially susceptible to wound infections, but because of the smallness of their bodies dressings applied as for adults do not remain in place and thus expose the wound to infection. The close proximity of all abdominal and thigh wounds to the genitals render them liable to be soiled with urine or fæces. Special consideration should be given to the need for small sized and securely fixed dressings in these regions.

7. The damaging effects of volatile anæsthetics. The harmful effect of chloroform on young animals under certain conditions is well understood (4), and I am sure that ether occasionally causes yet unexplained protoplasmal damage to some children after anæsthesia. Such children die without exhibition of clinical findings to account for their decline. Nitrous oxide gas is too dangerous for routine use among young children.

8. The high mortality is further increased by the serious nature of the afflictions, both congenital and acquired, requiring major surgery in early life.

9. I might add that young children seem to develop erysipelas after operation far more frequently than in the same number of adults. It usually puts in its appearance in some locality far removed from the wound; strange to say it does not seem especially destructive to life.

Infants and small children remain more quiet and are far more amenable to reason and good care than is supposed.

Restraint after abdominal operations is rarely required. I usually let these patients roll about with freedom. Their illness invites quiet and dorsal rest. Later the habit of being quiet is established. When quietude is necessary they may be restrained on a Bradford frame. When dressings are disturbed by the child the use of the arms may be limited by applying long cardboard cuffs at the elbow or the use of mits upon the hands.

In clean securely closed abdominal wounds children are often allowed to sit up to answer to the calls of Nature. All wound dressings should be small and when possible sealed, with a view to avoiding soiling (7). In abdominal wounds I am now using minute, thin gauze coverings, which are held in place by wide zinc oxide adhesive bands passing around the body. The adhesive extends well above and below the wound and is applied with sufficient tension to remove any pull upon sutures in case of crying or abdominal distention. The children wear stockings and shirts or gowns which are fixed well above the wound. Diapers, if used, are dropped low in front to expose the genitals. In low abdominal incisions the urine is caught in receptacles in infant girls or tubed away in cases of boys. The bed coverings should not rest upon laparotomized children for fear of their becoming wet or soiled, thus conveying infection to their dressings. The covers are elevated and fixed upon a cradle (7). Little children are kept in high railed cribs walled in and partly covered by sheets and in cold weather heated by hot water bags. These beds were originally designed by us for the open air treatment of burns (7).

In the after-care of all infants too much cannot be said about the value of intelligent feeding by competent pediatricians.

Preparations of the field of operation should be proportionately much larger than in adults. All preparations of the field should be made before the operation begins in order to diminish the time of anæsthesia.

Laparotomy sheets should be small to avoid unnecessary wrinkling and folding back over the small field and should contain small slits. All sterile coverings must be firmly fixed to the field because they easily slide off these little bodies, exposing unprepared areas. The use of laparotomy sponges should be avoided whenever possible. Those used must be in proportion to the size of child. Long, narrow sponges are altogether most satisfactory in pediatric surgery. I use three widths — two, three, and four inch — and eight to twelve inches in length.

The greatest assets in operations upon children are a stationary anæsthetist with modern appliances, a stationary table nurse, and an interested assistant, each of whom contributes to rapid work, short operations, and consequent safety.

The most frequent call for operations on infants in a children's hospital is for circumcision. If the lay demand were answered our work would be endless. There is a natural respect for this operation when connected with religious rites; otherwise, I feel that it is the most abused operation in surgery and one most poorly performed. Repair is not always a matter of a few days and the wound is not always free from infection, swelling, and pain. I believe that much of this is due to the use of catgut and to failure to engage in the sutures all of the tissue planes. I favor transfixion before the prepuce is removed. There are objections to every dressing in use. I have had the most satisfactory results when the wound was left entirely exposed but not allowed to come in contact with clothing or bedding. Sealed dressings invite the development of anaerobes, causing severe erosions of the glans which threaten destruction. When I first encountered this all methods of treatment were more or less of a failure until I read Dr. Corbus' paper on erosive balanitis. Since then I have used dilutions of hydrogen peroxide for wet dressings which put a stop to the destruction far more promptly than anything I have employed. Caustics and strong antiseptics when applied to the eroded areas are harmful.

Most of the babies coming to us for circumcisions receive dilatation of the preputeal ring and forcible retraction. Tight rings relax in time and when relaxed, if the mothers make diligent efforts to keep the foreskins retracted, they apparently shorten and in time remain retracted. The foreskin of most babies is long enough to be an excuse for an operation. I am usually guided by the following indications: Fissures and eczemas about the prepuce, other inflammations, rigid prepuceal rings, parental demands, and possible connection between the long prepuce and habits and neuroses.

Patients with hypospadias showing openings at the phrenum should rarely be operated upon. Many of these are harmed rather than benefited by operation. Unless there is some special reason for it, operation on the more deforming types of hypospadias and epispadias should be deferred until the organ is larger and easier to work with. Prepuceal hoods occurring in hypospadias should rarely be operated upon in early life because they may be of considerable value if plastic work is undertaken later.

Exstrophy of the bladder has not presented itself in my service. Among the cases which have come to my attention through my friends and associates, I recall no instance in which there was benefit of any consequence.

Stone in the bladder is not at all uncommon in early life. Since some of these do not cast shadows upon X-ray plates it is very desirable in suspected cases to examine the interior of the bladder both with sounds and the cystoscope. Cystoscopes for young children are now available. Stone-crushing instruments should be used when possible instead of suprapubic or perineal sections.

Next to circumcisions relief from inguinal hernia is most frequently sought. Unless there is some special reason for operating, an endeavor is made to educate the parents to the use of the truss for all young children. About 90 per cent of these coming to us before the age of four years, upon whom we use truss treatment, recover in less than two years. The younger the child and the smaller the hernia the greater is the certainty of a cure. A large percentage of the very young children show no return of their hernia after three to six months. Trusses are worn day and night

and in the bath; they are of hard rubber with no perineal strap. The truss must be thoroughly washed and dried each day. Unilateral inguinal hernia is treated routinely with the cross-body truss. If it fails to prevent protrusion the pad is turned upside down or one of a different size or thickness is applied. If these fail the French truss usually proves serviceable. Bilateral inguinal hernias are treated by use of the Hood's truss, and in babies having a pelvic circumference less than fourteen inches by a modification of this made for me by Hastings and McIntosh, Philadelphia. If the circumference of the child's pelvis is less than 12 inches it is not often easy to fit a truss.

I try to follow pretty closely the following indications for operation for inguinal hernia in young children:

1. Strangulation and incarceration.
2. Hernia not retained by properly fitting trusses.
3. Parental neglect in use of a truss, or parents who refuse to allow truss treatment.
4. Failure to cure after a child has worn a truss two to four years.

I much prefer to postpone operation for inguinal hernia until the child is of an intelligent age and will help to keep his wound free from excrement contamination. When operated upon, difficulties should be anticipated. Yourself and interne should look at the dressings upon each visit. Our after-care is about the same as that outlined for laparotomy. Larger children may wear one-piece pajamas out of which a large opening is cut, exposing the genitals and dressing (7).

Umbilical hernias are numerous in our out-patient work. I think those recovering by use of commercial trusses do so in spite of them rather than because of them. I have never seen one of these which could be kept in place. I use wooden button molds (hemispheres) about ¾ inch to 1¼ inches in diameter, covered with zinc oxide adhesive, ironed down with the fingers to smoothness. These are retained in place by wide strips of zinc oxide adhesive which encircle the body 1¼ times. The adhesive on one side of the body is lined so that the skin will be in good condition there when the appliance is next changed. It is changed about once in two weeks. The skin is cleaned with benzine, alcohol, and water in succession. The adhesive follows the contour of the body rather than encircle it; thus both edges of the binder are of equal tension.

The very small umbilical openings are usually surrounded by a thickened ring and rarely recover under treatment but usually recover spontaneously after the child has become very active. Large openings usually have very thin margins and often recover with surprising rapidity when once retained by the button.

Operations for umbilical hernia are uniformly done by an incision above the navel with its convexity upward. The navel is usually preserved. The peritoneal covering is freed and tied off and the fascial ring is usually closed with chromic catgut by transverse overlapping. Subcuticular sutures of silkworm gut are used, the ends of which are tied over a minute gauze dressing, and the child's body is encircled by a wide strip of adhesive.

The most frequent abdominal sections are done for congenital pyloric stenosis, acute and chronic intussusception, and appendicitis.

I have naturally felt the seriousness of gastro-enterostomy for congenital pyloric stenosis. None of us has approached Richter's recovery rate. I do not recall that any of the children I have operated upon have died as a result of the operation. They usually died from continued inanition. I do not think they should be placed in the wards with cases of inanition and enteric disturbances, but heartily advocate isolation of these children, who should be cared for by a nurse who does not come in contact with other children.

The ease with which the pylorus is found and delivered always tempts one to do a pyloroplasty. Usually the tissues are not sufficiently pliable to permit of the most popular of pyloroplasties. Dr. Stone of the Boston Children's Hospital recently told me of the success of Dr. Ladd and himself who have severed longitudinally the peritoneum and pyloric ring in the upper posterior quadrant down to the premucosal connective

tissue and the mucosa freed on either side the entire width of the ring. The mucosa at once protrudes into the gap and ought to prevent union of the severed ring. If we accept the theory that the hypertrophy is the result of frequent and violent contractions or that of spasticity of the pyloric ring the hypertrophy should rapidly diminish after severage when it is put to rest. He does not close the peritoneal covering of the pylorus. Dr. Strauss recently published a report of his work in which he bridges the gap with a flap from the under side of the muscle without opening the mucosa. Both operations are unique and are steps forward in pyloroplasty for congenital pyloric stenosis. Since my first two cases, done about eight years ago, I have limited my work to posterior gastro-enterostomy. I shall try the Stone-Ladd operation in my next case.

When I consider the high mortality in acute intussusception I often wonder if our results would not be bettered by the more frequent use of enterostomy. In chronic recurring intussusceptions I feel that it would be better for most patients and for the maintenance of confidence in the certainty of our results if we did more resections. This procedure should be largely limited to the use of those who have the ability to do well intestinal anastomosis.

Appendicitis in very young children rarely comes to my service, but after three years of age the patients are relatively numerous. This affliction is handled the same as in adults except that I drain children for mild pathologic conditions for which in adults I would not drain. This practice should be especially followed in anæmic and malnourished children.

I have been struck by the frequency of cases coming into the service with diagnoses of appendicitis giving suggestive histories and highly corroborative blood pictures, often with high pulse rates, most variable temperatures, sometimes pinched countenances, no regularity as to bowel conditions, general or localized abdominal tenderness, abdomen scaphoid or distended, and yet in whom there was no spasticity or tumor in the right iliac region. In spite of the general clinical pictures I have relied largely on the absence of tumor and spasticity in rendering the opinion that these were not cases of appendicitis. The subsequent clinical course and their failure to return to the service later has tended to prove the correctness of the diagnoses. Two of these proved to be cases of acidosis, and two others obscure pneumonias.

Prolapse of the rectum is often met with. I look upon this as being usually due to follicular infections, resulting in hypertrophy of the mucous and perimucous structures. The pathologic secretions are irritating and the tenesmus induced establishes a cycle resulting in relaxation and ultimate protrusion of the rectum. Treatment is always directed toward relief of the follicular infection by use of frequent cold saline irrigations with the hips elevated. The children are kept in bed a long time in the recumbent position in freely ventilated rooms and given regular free diet and tonics as indicated. The buttocks are strapped together with adhesive. Cathartics and astringents are both irritating and usually should be avoided. So many of these rapidly recover upon such simple treatment that I am appalled at the radical operative measures so lately recommended for their relief. Our operative work has thus far been limited to cautery punctures or stripping the lateral and posterior walls of the rectum with the cautery. I have found it necessary on one occasion to remove vertical strips from the mucosa.

Branchial cysts only occasionally come into the service. Two thyroglossal fistulæ have lately been dissected back to their origin.

In cases of cervical lymphadenitis where softening has not occurred, tonsils and adenoids are removed, often putting an end to the difficulty. Operations for tubercular adenitis are always preceded or accompanied by removal of tonsils and adenoids. I usually use an incision along the full length of the anterior or posterior border of the sternomastoid, through one of which I am usually able to reach glands in the remotest regions. In attempting enucleation I so often discover unexpected deep involvement, as was the teaching of Fenger, that I feel like returning to his method of starting out to do a radical adenectomy.

Three thymic resections have been done in the hospital in the last eight years. One of these children died of pneumonia, the others survived. I prefer a transverse skin incision about one and one-half inches long above the suprasternal notch, vertical muscle splitting, retraction, partial delivery, and partial removal. It has not been made sufficiently clear that all of the thymus must not be removed. When this is done in puppies it results in mental and physical defectives. In making the diagnosis, the clinical history, stridor, palpation of the upper border of the enlarged thymus, percussion borders, and X-ray findings must be relied upon. I consider bronchioscopic examinations as unnecessary to the diagnosis, and particularly dangerous to infants because of the prolonged anæsthesia and trauma which invite bronchitis and pneumonia. If made they should precede the operation by a week or two to give opportunity for recovery from the trauma. The operation of thymic resection can be made remarkably simple.

My service has given especial attention to the clinical study of goiters in child life. We have found that these children are easily fatigued and always show some form of deficiency which is most variable in its gravity and manifestation. I think the syndrome of simple goiter, which I have described, is the result of chronic toxæmia. Since our observations began, I think I am safe in saying that every child we have examined, presenting a goiter, has shown hypertrophied tonsils which usually contained pus or cheesy material. Two brothers having large goiters and severe acne, lately had tonsillectomies and showed marked diminution in the size of their goiters within a week and subsequent slow improvement. A pale malnourished girl with a very large goiter and having a bad blephoritis marginalis which did not improve under treatment, had this almost disappear in three weeks after tonsillectomy and with marked general improvement and diminution in size of goiter. Dr. David Fiske recently removed for me the tonsils of a robust Jewish girl with a very large thyroid and at the end of a week reported that he thought the gland had diminished in size about 50 per cent. All of these were diffused enlargements of both lobes showing no nodulations and occurred in children after the pubescent period.

Younger children with goiter seem to most commonly show recognizable enlargement of the gland between the ages of seven and ten, and it usually begins in one of the lower poles of the thyroid, usually the right, in the immediate neighborhood of the entrance to the thymic lymph-channels which drain into those of the thyroid at this point in both lobes. The almost uniform location of the beginning of goiters in early childhood at this point and the uniformity with which these show pathologic tonsils suggests that the primary hypertrophy of the thyroid results from an extra effort to detoxicise or to destroy bacteria which has escaped the cervical and mediastinal lymphatics, and instead of being passed to the thoracic duct is segregated and passed to the thymus and then to the thyroid. We commonly see ten or more of these goiters each clinic day and have seen as many as twenty-two in a day. It is noteworthy that out of this large number I have never seen a single patient showing enlarged cervical lymph-nodes. This would suggest that the bacterial flora of the tonsils in these cases have a selective tendency and certainly do not attack lymph-glands. Operations on the thyroid are not often necessary in ordinary hypertrophies of the thyroid gland in child life. I am now removing focal infections then attending to anæmias and give thyroid extract if the goiters continue. Advanced pathologic changes in the gland are dealt with as in adults.

It is difficult to retain head dressings upon young babies. This may be successfully done by a four-tailed gauze covering tied beneath the chin and behind the neck, making a bonnet.

In turning back skull flaps in babies after making the trephine openings, scissors may be used instead of ronguers to cut the bone flap. This is a great time-saving step and diminishes trauma to the cortex.

Patients with hydrocephalus are presented with painful frequency. Examinations should always include retinoscopy. Many

of these children are blind. The varying causes of hydrocephalus and the varying pathology must be borne in mind; therefore it is absurd for us to place faith in any one operation. In one of our cases, upon entering the dura I found no cortex. The calvarium was filled with fluid. Upon post-mortem we found at the base a deformed pons attached to a little brain matter spreading out to and blending with the dura at the base, the total mass of remaining brain not exceeding the size of two hen's eggs.

No true Jacksonian epilepsies among children have come under my care. A number of exploratories have been done for epilepsy at the suggestion of Dr. Rothstein. It is worthy of notice that many of these had normally developed skulls but atrophic or sclerotic brains with poorly developed convolutions. These brains came far from filling the skulls and there was much subpial œdema. In such cases one looks upon a translucent, jelly-like area of yellowish color. I call attention to this because this condition is so often taken for cortical cysts and efforts made at removal or drainage. Post-mortem usually shows this condition generalized. Only two of the surviving patients have shown improvement. In this group our efforts have been directed toward diminution in size of the skull, thus to compress the brain and diminish the œdema. Large bony flaps have been removed on one or both sides; the periosteum was left and sutured in place. The same finding occurs in many long-standing cases of spastic paralysis for which the same operation has been performed and has thus far been without benefit.

Recent cases of Little's disease can and must be diagnosed early and usually operated upon at once. Results have been very fair both as to life and prevention of spasticities.

The splinting of fingers and hands of little babies is difficult. They easily worm out of their dressings. Injured fingers may be dressed and then splinted by four toothpicks laid at equal distance on a strip of adhesive. This is rolled about the thin finger dressing. A bandage fixes this to an adjacent finger. A few wraps are taken around another finger. A tongue depressor is bound to fingers, hand, and forearm and all put in an anterior splint.

Fractures of the elbow are the most common of arm fractures in our service. I think fractures of the capitellum are usually mistaken for dislocations; they are easy to reduce and the results are excellent. X-rays are taken of all fractures and reductions are made under anæsthesia. Correct position is the best splint and the best insurance against an obstructing callus and future limitation of motion. The arm in elbow fractures is always put up extended or at that angle giving the best approximation. Right angle and extremely flexed positions often give the most extreme displacements. We have had no regrets. No early massage or passive motion is indulged in. These are the best methods of breaking up embryonic tissue, exciting extra callous formation and creating fixity. I favor open operations to correct irreducible malpositions, but rarely plate children. Where temporary fixation is required I often use Albert's staples. Angulation in the long bones resulting from union in malposition is corrected early by slow bending; if old, by subcutaneous osteotomy when applicable. Many terrible deformities seen upon the X-ray plates turn out to be good clinical results after eight to twelve months. Angles in bones of young children straighten partly by elongation and partly by spontaneous correction.

Fractures with displacements in the upper half of the femur in infants are difficult problems. We use no one treatment. Casts with or without extension as indicated are preferred. When brace shops are at hand we shall use crowding braces for these little folks. Vertical extension with abduction does not always provide the desired result. It is too generally applied and too much reliance is placed in it without due regard for many adjuvants and other methods.

Bow-legs are treated by osteoclasis with excellent results in younger children, but in older children I consider single or multiple subcutaneous osteotomy to be the operation of choice. As a general surgeon I feel ob-

ligated to our orthopedic colleagues for what has been accomplished in this field by the foregoing methods but I wish to condemn as dangerous and unnecessary routine open osteotomies for bow-legs and knock-knees. I am afraid that both general and orthopedic surgeons are forgetting the possibilities of effacement of bows by the elongations of growth and the results obtainable by the use of fats, phosporus, and tonics. I have seen more than one bow-legged patient straighten up perfectly upon medical and dietetic treatment when the treatment was undertaken early in life.

Injuries either to the bones or soft parts of the lower extremity requiring long rest in bed are frequently followed by relaxation of the ligaments at the knee and knock-knee ensues. These should be treated early by overcorrection and long casts or braces. If they persist they should be corrected by subcutaneous osteotomies.

In acute osteomyelitis increasing experience has taught me to operate when clinical signs are present. Too often these clinical signs are disregarded because the X-ray shows no focus and when the second plates are made there is often great bone destruction shown. When clinical evidences are present one may at least drill an opening in the bone cortex to lessen tension and thus limit destruction.

Scurvy is often overlooked and when seen in the X-ray plates may be looked upon as syphilis. Other symptoms than bone changes should be sought.

Bone syphilis is an important and frequent affliction in child life. X-ray plates are very valuable aids in diagnosis.

Operations for harelip have been uniformly satisfactory. I use horsehair sutures and either no dressing or tincture of benzoin spread on the surface. No tension sutures are used. The cheeks are held together by zinc oxide adhesive cheek-covers united with silk thread, which is held up off the lip by rolls of gauze placed just outside the angles of the mouth.

Cleft palates are united with horse hair. A straight five-eighths-inch Hagadorn needle is used in placing all but post-alveolar sutures. I rarely use tension suture and seldom make the Langenbeck lateral slits.

My wards nearly always contain a number of children who have been burned. Such accidents to these little children seem so unnecessary since many are due to the children tipping scalding water upon themselves or falling into receptacles containing hot water. It seems that warnings by public health departments and the press would not be affectual because they would require continual sounding and would rarely reach the parents of these victims who do not read. The large death-roll and our own helplessness to prevent many of these deaths is depressing. These children commonly die suddenly after a period of undue ease and brightness or delirium. Those who survive have been treated with satisfaction by the open-air method, allowing the secretions to dry on the wound. Healing is rapid for a time, but in severe cases it finally becomes sluggish when the abraded areas are strapped tightly and smoothly with zinc oxide adhesive, which hastens repair beyond my first expectation. These are dressed every two to four days. Both methods seal in to some extent the wound secretion. At any stage of repair this secretion may become toxic and the situation serious. The first evidence of this is usually loss of appetite followed by vomiting, elevation of temperature, and later by coma and sometimes convulsions. I have learned to abandon either method when the first toxic symptoms appear, keeping the wound free from crusts, dressing with gauze wet in normal salt solution twice daily until the toxic symptoms disappear.

In conclusion let me add a word to my surgical friends about the value of council with pediatricians in pediatric surgery. Our work is limited among this class of patients; we are not as familiar as we may think with diagnosis or the therapy of children, and it is my earnest belief that each of us will find the convalescence more smooth and the safety of young patients increased when, if the child is not doing well, we have the child's internist examine it and direct its feeding and medication; there is no field in which the internist is of greater or more unexpected assistance.

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# PATHOLOGICAL FINDINGS IN RETRO-INGUINAL HERNIAS

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RETRO-INGUINAL hernias (Corbellini 1906) are the classical direct hernias, the internal hernias of Tillaux, the "juxtafuniculaires" of Villette. Retro-inguinal hernias are found in 10.63 per cent of the cases coming to operation. All cases of rupture should be studied further than the simple consideration of the inguinal canal and the hernial tumor. In retro-inguinal hernias there is a distinct difference from the picture presented in oblique hernias. The conjoined tendon instead of being directed obliquely downward and inward in front of the rectus muscle to be inserted in the pubis, is directed transversely inward to join the outer edge of the rectus. Owing to the atrophy of the fibers of the conjoined tendons, the rectus edge is visible for 4 or 5 centimeters. We thus have on the inside the external border of the rectus, Poupart's ligament below, the inferior edge of the internal oblique and transversalis muscles above, making a triangular space the outlet of the retro-inguinal hernia, as has lately been described by William Hessert. In all our cases there was atrophy of the conjoined tendon and Hessert's triangle. The cremaster muscle was absent in most of the cases, especially its internal border, which we have found but once.

The hernial tumor is only loosely attached to the cord and to the floor of the canal at its upper end, but at its base it is firmly bound, owing to the continuity of tissue. Its form varies according to its size, from the simple dome-shape to the true sac. The hernial tumor is formed by the transversalis fascia, properitoneal fat, and peritoneum, and may contain any of the organs of the abdomen or organs likely to be found in a hernia. In the base of the tumor which is always very broad, fibers are found which serve to re-enforce the transversalis fascia. These fibers run almost horizontally inward and below and are most abundant and strong in the upper part. In front of these, other fibers are sometimes seen directed upward and inward which belong to Hesselbach's ligament. The transversalis fascia overlies the properitoneal fat to which it is loosely attached. This fat is most abundant toward the inside where it begins to take on the appearance of the prevesical fat. On the outside the fat surrounds the epigastric vessels which lie immediately below the fascia. Lower down against Poupart's ligament this fat is generally abundantly vascularized. The peritoneum does not present any peculiarities except for its great thinness.

These may be said to be the general characteristics of all retro-inguinal hernias. A careful review of our cases shows that there are various types and the consideration of these would seem to justify a division into three varieties which we should name according to the predominant element; viz., saccular, lipomatous, and splanchnic, enumerated in the order of their frequency. In the first variety (Fig. 1), the tumor in most of the cases is hemispherical, but in large ruptures it may present a long sac. It is made up of the transversalis fascia, more dense in the base; properitoneal fat which is scarce at the apex and abundant at the base; and a third layer, the peritoneal sac. If we pull the sac toward us, we will find on its medial

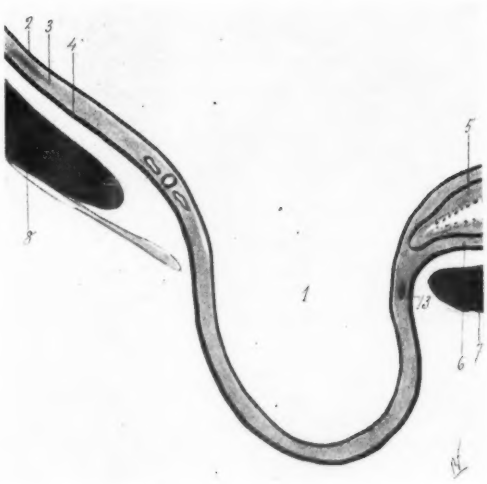


Fig. 1. Saccular hernia.

1, Saccular cavity; 2, peritoneum; 3, properitoneal fat and deep epigastric vessels; 4, transversalis fascia; 5, bladder; 6, prevesical fat; 7, rectus muscle; 8, wide muscles of the abdomen; 13, stump of the obliterated hypogastric artery. Schematic drawing following the great axis of the hernial tumor horizontally.

side the bladder and sometimes the cord of the obliterated hypogastric artery in the middle of the prevesical fat. This is noted as a reddish, white, flat cord passing above and to the inside. On traction motion is transmitted to the navel. During the operation it is easier to investigate this by pressing on the navel through the towels when the umbilical cord is stretched.

On opening the sac nothing of importance is noted. The fingers should always explore the peritoneal cavity and the inguinal fossa; for on several occasions we have found an co-existing oblique hernia on the same side.

The variety just described has been found in 73 per cent of our cases and we have named it the saccular type.

The second or lipomatous type is shown in Fig. 2. To the inside of the cord in a portion outside the canal is found a clear yellow lobule of fat attached to it by a thin connective tissue. This lipoma completely encapsulated presents a strangulation which corresponds to the external ring. Beyond this it bulges out in the form of a funnel, presenting the same characteristics as the other varieties. If this lipoma is cut in its saggital plane from its tip to its base, at its neck will be found the cavity lined by smooth connective tissue resembling the interior of a hernial sac. If the finger is introduced into this pseudocavity the mass may be removed down to the peritoneum. In one case the cavity was so large we could get a whole pair of scissors into it without difficulty. This connective-tissue space which is located in the properitoneal fat limited above and outside by the sac is nothing but a prolongation of Bogros' space. The sac is always small, simply a peritoneal infundibulum with very thin walls covered by a layer of fat. To find it one must cut through the base of the tumor in its supra-external portion immediately inside of the deep epigastric vessels.

This marked preponderance of fat over the other elements in the hernial tumor is our reason for naming this variety the lipomatous hernia to differentiate it from the variety of oblique hernia known as hernia adiposa. Lipomatous hernias occurred in 20 per cent of our cases.

We call the third variety splanchnic since a viscus takes part in the formation of the tumor. The splanchnic hernias are large and partially irreducible. The transversalis fascia is only apparent at the base of the tumor. Within the sac is seen a fatty mass which has all the appearance of the omentum changed by an inflammation. This clear, yellow fat prevents one from seeing the vessels. A few milky spots on its surface and its adhesions to the sac complete the picture of omentum. This fatty mass is attached by a mesentery to the internal part of the sac. If a finger is run along the tumor it will be found to go behind the pubis instead of upward as it would in tracing the pedicle of an epiplocele. This enables us to differentiate these hernias from inflamed and adherent omentum. If we cut through the peritoneum it may be dissected out easily. Under a layer of fat, not thick and a little vascular, the bladder is found and at times other pelvic viscera. The bladder is the most frequent of all organs found in these hernias. The fat which lies on its internal side and in the neighborhood

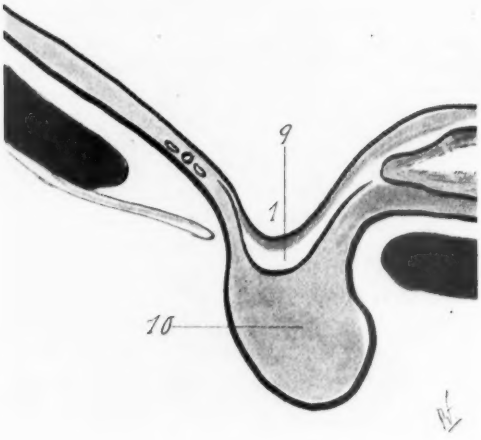


Fig. 2. Lipomatous hernia.

1, Saccular cavity; 9, prevascular "decolable space," a prolongation of Bogros' space; 10, lipoma. Schematic drawing following great axis of hernial tumor.

Fig. 3. Splanchnic hernia.

5, Bladder; 6, prevesical fat; 11, fascia "d' accolement" (Lardennoir and O. Kinezie); 12, large intestine; 13, stump of obliterated hypogastric artery. Schematic drawing following great axis of hernial tumor.

of its tip is reddish yellow crossed with thick veins and contains the hypogastric artery. In the space of Retzius there is no room for the herniated portion and to reduce it we must make a space by the divulsion of the tissues. Great difficulty is found in these cases in identifying the deep epigastrics.

The third variety, the splanchnic hernia, was found in 6 per cent of our cases. Now, one may ask, are these three pathological forms different entities or are they variations in the evolution of the hernia? A priori the latter hypophysis would seem to be true. The hernia begins in the lipomatous form, ends in the atrophy of the fat together with a gradual increase in size of the sac, ultimately producing a sac containing some viscus. However, a study of our statistics leads us to a very different conclusion since lipomatous varieties have been found which persist for seven or eight years without any treatment, and splanchnic cases have been found which develop in one year to a large size having had from the beginning the characteristics of the splanchnic variety.

These facts lead us to believe that the right inguinal hernias may be divided into three distinct, separate entities as mentioned above, and that each of these may be varied by local conditions. In the first two varieties there is generally a more resistant canal. The internal ring is not very large and the tissues in general are less relaxed. In the splanchnic variety all the conditions which favor the growth of large ruptures are present; aplasia, general relaxation of the tissues, the flaccid abdomen, and the superabundance of fat; the inguinal canal does not exist; the external ring is very large; the properitoneal fat, the length of the mesentery, the very large fat appendix, the prostatic enlargement, altogether produce a condition favoring mobility of the viscera and easiness and simplicity of production.

# THE TREATMENT OF CHRONIC NON-TUBERCULOUS EMPYEMA [1]

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From the Mayo Clinic

CERTAIN thoracic diseases which for generations have fallen to the lot of the surgeon are yet badly handled. Conspicuous among these is that patriarch of the surgical scrap-heap, chronic empyema. There is obvious opportunity for improvement in the treatment of this disease.

A patient thus afflicted presents a typical picture: that of a stooping, one-sided, emaciated, pale, clubbed-fingered individual—not seriously ill, but nevertheless a chronic invalid. He oscillates daily between the surgical dresser's room and the park bench, his family meanwhile suffering the poverty incident to his inefficiency. There is generally an opening somewhere in his chest. It has been there for from 6 months to 25 years. He is the survivor of one and perhaps of several operations, and yet pus continues to discharge from his side. The surgeon passing through the dispensary recognizes one of these unfortunates and proverbially remarks to himself: "Some day when there is a shortage of more interesting material I must take out some more of that man's ribs." The patient meanwhile continues the object of procrastination and neglect.

It may be said that the chronicity of these cases is rather more the result of the surgeon's lack of persistence in bringing his patient to the point of cure, than it is to ill choice of method or lack of surgical skill.

## LOCALIZATION OF CAVITY

Assuming that the diagnosis of chronic empyema has been made, the first step in treatment is the determination of the size and location of the persisting cavity. This, of course, depends upon the direction and extent of lung retraction. Auscultation and percussion as a means of diagnosis are valueless or to say the least so inadequate compared to other methods at our disposal that they may be disregarded.

If a sinus in the wall of the chest has been produced *per necessitatem* or by previous operation, an olive-tipped flexible probe if inserted into the cavity will at least disclose the longest diameter. If rotated within the cavity the arc expressed by the olive tip may be noted from the corresponding rotation of the flattened handle. Thus the lateral diameters may be estimated with surprising accuracy.

Stereoscopic roentgenograms contribute in the localization of a cavity according to circumstances, If the empyema is of long duration and has never been drained, the roentgen ray will cast a deep shadow which is continuous with and not distinguishable from the adjacent thickened pleura. The actual size and location of a cavity is therefore not demonstrated. If the pleural pus has been draining through a bronchus, pyopneumothorax is present; a fluid level is shown. The empty part of the cavity is outlined and the shape of the remainder may be roughly estimated. If the cavity has been drained through the chest-wall and is practically emptied of its contents, the stereoscopic roentgenograms will portray the outlines of the cavity in a large proportion of cases. The exceptions are those instances in which the cavity is not situated in the usual lateral portion of the chest (Figs. 1, 2) but rather anteriorly or posteriorly (Figs. 4, 5). Under such conditions the lung is not thrown in silhouette as in cases in which there is a lateral cavity, but rather overlies the cavity and its own markings obscure the cavity outlines. It would seem that the stereoscope would overcome this obstacle but unfortunately such is rarely the case.

By far the most accurate and satisfactory method of outlining cavities associated with a sinus of the chest-wall is the following: A narrow bandage or tape is unwound and immersed in barium-sulphate and water mixed to the consistency of thin cream. With a probe it is fed through the sinus into the

[1] Read before the Missouri Valley Medical Society, September 23, 1915, Des Moines.

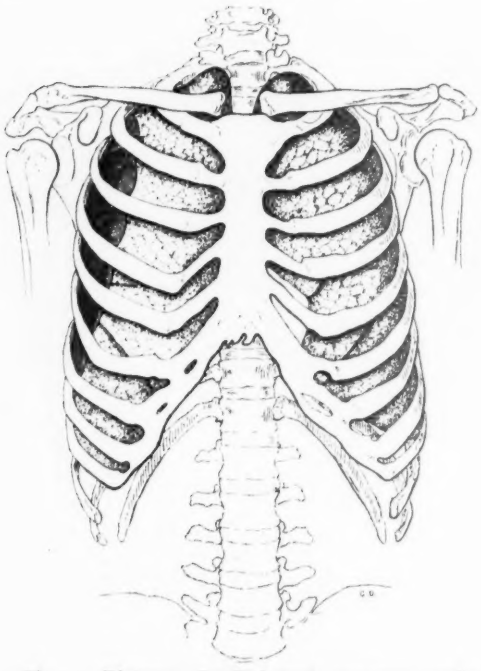

Fig. 1. Diagram. Small lateral empyema cavity. The most common type: generally demonstrable in radiogram. Curable by shrinkage type of operation, or by any of the cavity filling operations. Decortication not necessary.

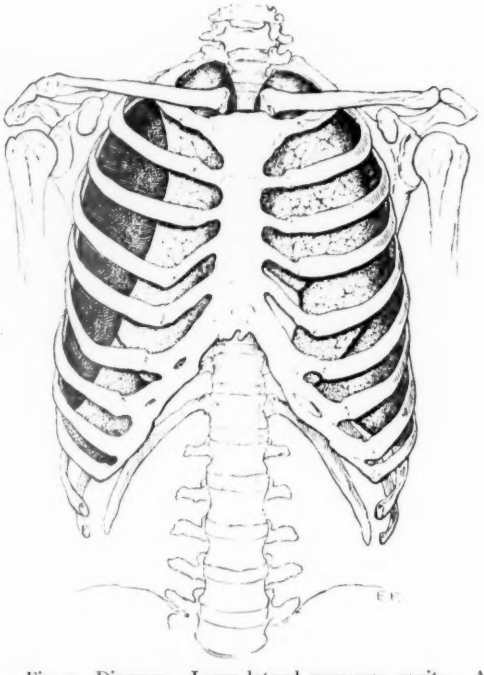

Fig. 2. Diagram. Large lateral empyema cavity. A type demonstrable in radiogram. Suitable for decortication followed by further osteoplastic resections of either the filling or shrinkage type.

cavity, care being taken that each loop of the tape is carried to the limits of the space until it is packed full. A stereoscopic radiogram is then taken (Figs. 9, 10). The mass of barium-soaked tape casts a definite shadow which is distinguishable from the lung-shadow even when the two are superposed as in the anterior and posterior cavities mentioned above.

The injection of liquid mixtures containing bismuth or barium has long been utilized in conjunction with the roentgen ray to demonstrate empyema cavities. It is often difficult to completely fill the cavity with such mixtures. If a bronchial fistula is present a sudden flooding of the trachea may occur, the consequences of which are rarely fatal but sometimes alarming. Bismuth retained after such infections, particularly when the sinus is small and the outflow is obstructed, may lead to a moderately severe reaction; this is an unwelcome incident in the course of a purely diagnostic measure. Suffice it to say that the packing with barium-soaked tape is simpler, safer, and equally efficient in demonstrating cavities.

The cystoscope has been employed to survey empyema cavities. There is little to be derived therefrom.

The diagramatic drawings shown in Figs. 1, 2, 3, 4, 5, 6, 7, and 8 were made from a skeleton thorax in which the retracted lung was modeled in wax in many of the positions in which the writer has found it at operation. To these might be added illustrations of the many types of smaller cavities resulting from localized septic effusions including the particularly rare form of interlobar empyema.

### PRELIMINARY DRAINAGE

It is plainly apparent that no one method

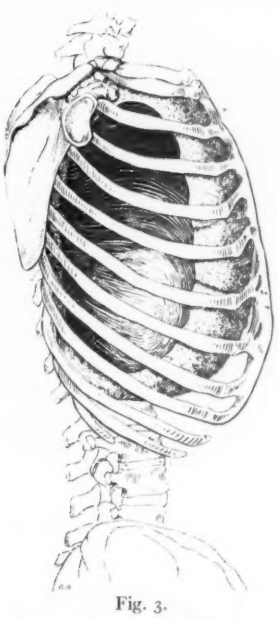

Fig. 3.

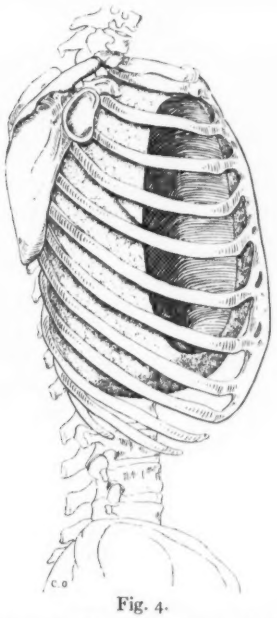

Fig. 4.

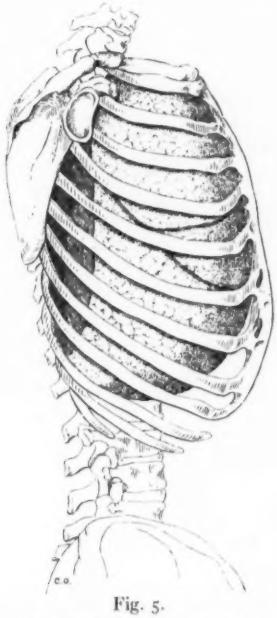

Fig. 5.

Fig. 3. Diagram. Lateral view of cavity shown in Fig. 2. Illustrates the enormity of any osteoplastic resection undertaken previous to an attempt at decortication.

Fig. 4. Diagram. Anterior cavity. Not demonstrable by radiogram except in lateral view or in conjunction with barium-soaked bandage pack. Suitable type for Schede osteoplasty combined with muscle implantation. Also suitable for the infolding lateral flap operation.

Fig. 5. Diagram. Posterior cavity. Particularly suitable for the lateral flap infolding operation.

of treatment nor any one type of operation would be suitable for all chronic empyema cavities which assume such a diversity of size, shape, and location. Nevertheless, one cardinal rule of treatment may be laid down at the outset, which is applicable to them all. No operation designed for the obliteration of a chronic empyema cavity should be performed until this cavity has been provided with wide open drainage at the lowest possible point for a period of at least 6 weeks.

The case to be treated presents one of the following conditions:

1. An incarcerated accumulation of pleural pus which has remained unrecognized and undrained for months and even years.

2. A cavity which "leaks" but does not empty through a bronchial opening, situated generally at a level far above the bottom of the space.

3. A cavity which leaks an absurdly small proportion of its contents through an empyema necessitatis opening in the chest-wall.

4. A cavity which drains profusely and yet incompletely through an operative wound from which the drainage tube has been prematurely removed.

In each and all of these conditions the patient is the unfortunate carrier of from a half pint to three quarts of residual pus. He is suffering from a chronic low grade septic absorption. He is a poor surgical risk, particularly for the type of operation to which he must eventually be subjected.

A preliminary drainage operation is therefore indicated in nine-tenths of the cases first met in a surgical clinic. The bottom of the cavity is located with an exploratory needle attached to a tight glass-barreled syringe. It matters little whether or not there are already openings in the chest; generally they are too high and too small to be regarded. Through such openings a curved probe may aid in locating the real bottom of the pleural space, at which point an inch of rib is resected and a large tube inserted.

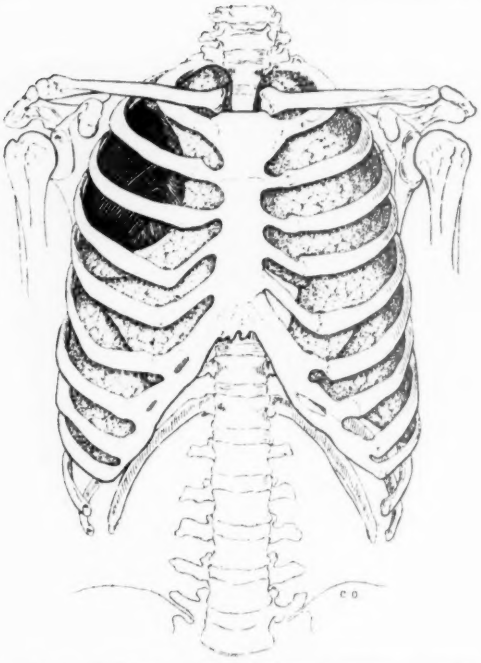

Fig. 6. Diagram. Type of chronic empyema cavity which may follow pneumonia of the upper lobe. External filling type of operation indicated.

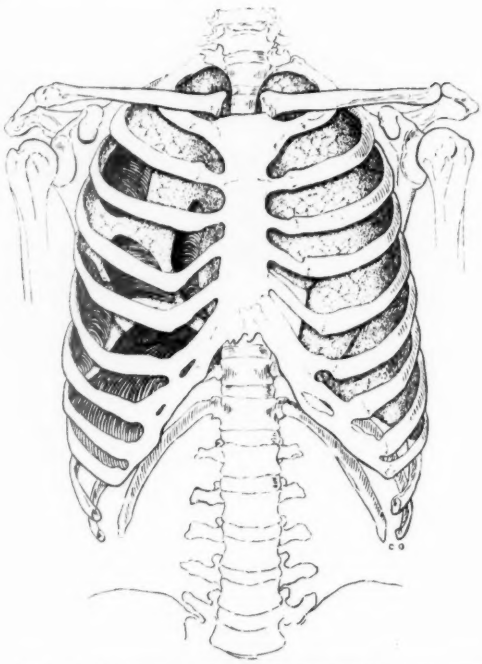

Fig. 7. Diagram. Multiple encapsulated empyema cavities. Generally fatal in the subacute stage because of impossibility of diagnosis and localization. Drainage operation evacuates one cavity only.

The improvement of a patient thus provided with new drainage is striking. There may be a weight increase of twenty pounds in 6 weeks. Then and not until then is radical operation to be undertaken.

### TREATMENT WITHOUT OPERATION

This subject is scarcely worthy of discussion. Generally speaking, non-operative treatments in chronic empyema are attended with cure only in those patients who would have recovered eventually and with like promptness without any treatment. It is an established fact that fibrous connective-tissue formation on the pleural surfaces occurs with slow but regular growth, diminishing the capacity of the cavity accordingly. Shrinkage of all tissues associated with some deformity further contributes to the obliteration of the pleural space. It is not surprising, perhaps, that the enthusiastic physician employing some non-operative method, credits the apparent improvement to his therapy rather than to the physiologic processes which have meanwhile been at work.

Thus the vaccine enthusiast receives his regular pittance for months. His conscience is relieved by the apparent diminution in the amount of discharge. The patient is temporarily encouraged and he notes further that the discharge is less offensive. From these facts, both assume that the cavity is much reduced in size. Vaccine therapy is indicated for sypmtomatic relief. It will not cure. There is no real evidence that any of the physiologic healing of processes in the pleural cavity are fostered or stimulated by vaccines. The subject is worthy of mention only in the sense of caution. Vaccine therapy has done far more to postpone unnecessarily the obviously necessary surgical procedure than it has ever done even in the relief of symptoms.

Bismuth and vaseline (Beck's paste) is commonly used as an injection. This form

of therapy has definite limitations which were lamentably overlooked until a number of disasters emphasized them. The mixture has a definite bactericidal action upon the secretions of septic cavities. When an empyema cavity has thus been rendered sterile the tendency of the chest-wall opening is to close. The cavity remains. Both physician and patient rejoice at a cure which is far more apparent than real. If the outflow of the infected mixture has been incomplete during the treatments, the bismuth incarcerated in the large cavity may gradually produce symptoms of bismuth poisoning. Fatalities unquestionably have resulted. Furthermore months or even years after the closure of the sinus and the apparent cure of the patient, febrile symptoms have developed with all the other indications of retained infection within the chest. If drainage is not re-established an empyema necessitatis may develop in the scar to the surprise and mortification of the physician who finds on further examination that a large cavity still persists which, though temporarily sterilized by the mixture, has through blood or lymphatics become reinfected, with dire results.

Empyema cavities of more than six or seven ounces capacity should not be injected with bismuth and vaseline except to reduce an overabundant secretion by lowering the toxicity of the infection. In such usage care should be taken that the mixture injected is provided with free, unobstructed escape.

Small empyema cavities either primarily small or rendered so by previous operations may be injected with the deliberate intent to sterilize them and to heal their drainage openings. The physician should acquaint his patient with the fact that the apparent cure resulting may not be a permanent one; advising him further that upon the appearance of any untoward symptoms he should return for consultation and perhaps for reopening of the sinus. Certain observers have been sufficiently cautious in employing this therapy to aspirate with a needle the persisting closed cavity from time to time to determine the degree of obliteration and the endurance of the sterilization.

The non-operative treatments of chronic empyema then, some of which have been mentioned in the foregoing, must be employed with caution and with understanding as to the occasions when they are indicated.

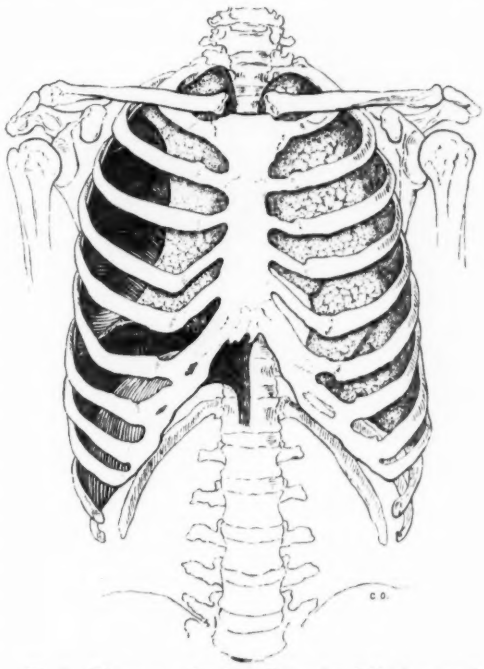

Fig. 8. Diagram. Combined lateral and diaphragmatic empyema cavities not connecting. Accurate diagnosis generally impossible. One cavity generally drained; the other overlooked. Particularly adapted to operation of Lilienthal type.

### SURGICAL TREATMENT

The necessity of preliminary drainage at the extreme bottom of all empyema cavities previous to more radical procedures for obliteration has been emphasized. The patient returns 6 weeks or 2 months after this preliminary with his maximum resistance. An operative fatality is now inexcusable. It occurs for definite avoidable reasons:

1. When an attempt is made to accomplish the obliteration of a large cavity in a one-stage operation.

2. When there is an erroneous conception of the degree of resistance possessed by a given patient together with an operative procedure which overtaxes his resistance.

3. When the atrocious custom is employed of operating upon these patients until symptoms of shock appear; with ignorance of the fact that the maximum shock after such osteoplastic operations is not demonstrated until after 2 hours.

4. When there is undue regard for hæmostasis, loss of blood being far more contributory to shock in such cases than trauma.

5. When there is an excessive expenditure of time.

6. When the administration of the anæsthetic is unskillful.

The operations may be discussed as being of two types, each designed to further one of the two physiologic healing processes; namely, shrinking of the diseased half of the thorax, or actual filling of the empyema-cavity itself. Any attempts to fill the cavity are necessarily accompanied by a certain degree of shrinkage because of the rib resection necessary to permit accessibility to the cavity. Operations designed for shrinkage, however, may not contribute in the least to actual filling. For example, the Wilms operation consists in the resection of one-half inch segments of several ribs at their angles posteriorly and at the costochondral juncture anteriorly. The normal curve of each rib from angle to cartilage remains unaltered. Approximation of the shafts of the ribs is promoted, nevertheless, by the release of their anchorage front and back. A moderate degree of slumping of the costal arch at the sternal and vertebral ends may also occur. In other words by this type of operation the lateral thoracic diameter is reduced. The lateral contour is considerably flattened, but one fails to produce any actual caving in over the cavity-area which could be said to contribute to its filling.

The Estlander operation consists in the excision of several segments of several ribs in any portion of their shafts. A moderate degree of local slumping of the thoracic wall may occur after the more radical operation of the Estlander type, although its function is essentially to produce a uniform shrinkage. In fact, it was the failure of Estlander's operation to contribute to any marked degree to the obliteration of a cavity which led Schede to describe his operation the very nature of which accomplishes a local chest wall collapse. Estlander's name is commonly attached erroneously to operations of the Schede type. One effects shrinkage alone, the other both shrinkage and collapse.

The distinctive feature of the Schede operation is the complete removal of the bony wall of the empyema cavity; in other words, the free resection of all ribs overlying the cavity regardless of the number or extent (Fig. 12). Schede also recommends the removal of the thickened parietal pleura lying beneath the resected ribs and forming the outer lining of the cavity (Fig. 13). He thus sacrifices a layer of tissue often more than an inch in thickness, increasing one diameter of the cavity correspondingly. He argues that the removal of this leathery, unyielding layer permits a more complete slumping of the skin and muscle flap into the depths of the cavity, thus gaining more in the obliteration of the space than was lost by the sacrifice of the connective-tissue mass which nature had labored perhaps for several years to produce. He adds that the muscle surface now forming the outer wall of the cavity will granulate rapidly and aid further in the filling function.

Even the Schede operation, radical and mutilating as it may seem, often fails to accomplish its primary purpose; namely, to produce filling by local slumping. Probably a Schede type of operation was never performed without a certain degree of reduction in the cubical contents of a cavity. This, however, may be explained more by the general thoracic shrinkage which such an extensive rib resection obviously permits, than by local filling. These are two explanations for this "filling defect" (to borrow a roentgenologic term). If the skin and muscle flap are sutured accurately to their original position, a tense, somewhat tightly drawn covering is provided to the cavity, which spans the space but does not enter it. If, thanks to the paucity of ribs, the skin and muscle flap at first spread loosely over the gap, the healing contractions tighten it later into a spanning membrane.

Another explanation of the frequent failure of the Schede flap to assume the concave

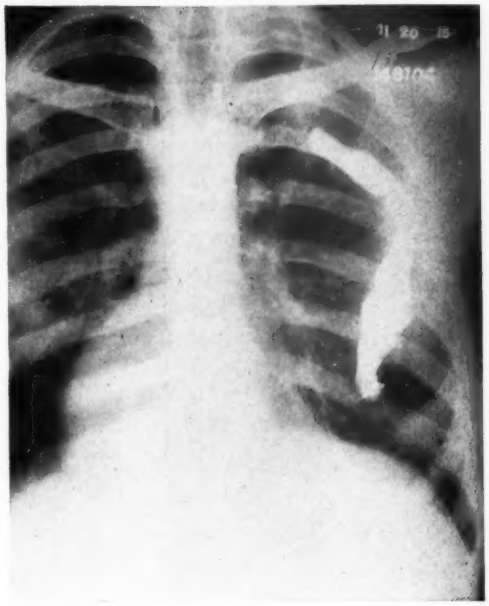

Fig. 9. Radiogram of empyema cavity packed with barium-soaked tape, showing that a tortuous narrow cavity may be thus packed. Illustrates type of cavity suitable for antiseptic injections (Beck's Paste).

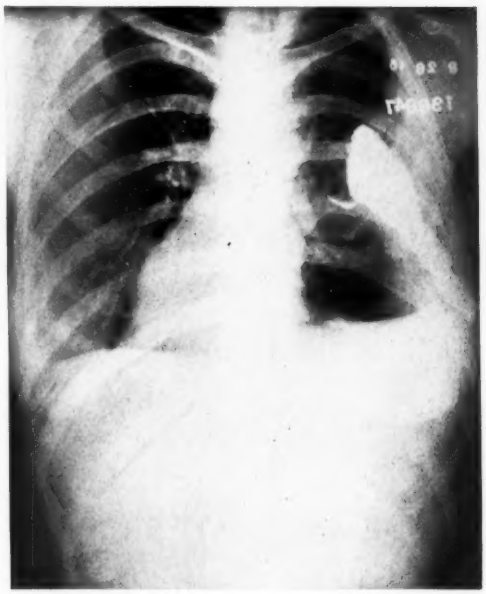

Fig. 10. Cavity, incompletely demonstrable by radiogram alone, defined by barium-soaked pack.

curve of the cavity is to be found in the error of dividing the covering ribs in such manner that their ends directly overlie the borders of the empyema gap. A rigid bony rim is thus provided to the cavity over which the flap must make an abrupt pitch in order to follow its curve. If, on the contrary, the ribs are divided an inch beyond the pleural limits of the cavity, the pitch is a more gradual one.

The Fowler-Delorme operation of decortication is designed to fill the empyema cavity from within; the Schede type seeks to fill from without. The Fowler operation, theoretically at least, aims to obliterate chronic empyema cavities in the ideal fashion. It not only should minimize deformity of the contour of the chest-wall but also by ridding the lung of its thick pleural covering favor its re-expansion, thus restoring more nearly its full respiratory function. All other osteoplastic operations for this disease deliberately abandon the lung itself to its retracted state and to its impaired function. The technique is not elaborate or difficult of execution. Several inches of several ribs in the region of the cavity are resected. Some parietal pleura is removed producing an opening through which instruments and fingers may strip the visceral pleura from that portion of the lung forming the inner wall of the cavity. Thus liberated, the lung should expand. When it does, the picture is awe-inspiring. The cavity appears to be filled from the bottom up.

Ransohoff's operation is a modification of the decortication type. The visceral pleura is not stripped but incised with multiple cuts intended to reduce the tenacity of the fibrous pleural layer so that it yields to the ever-present tendency of the lung to expand.

Appealing as the operation of the Fowler-Delorme type may at first appear, the results are not infrequently disappointing. The area of cleavage below the visceral pleura is not always unobstructed. Fibrous bands may cross from the thickened pleura to the interalveolar connective tissue of the par-

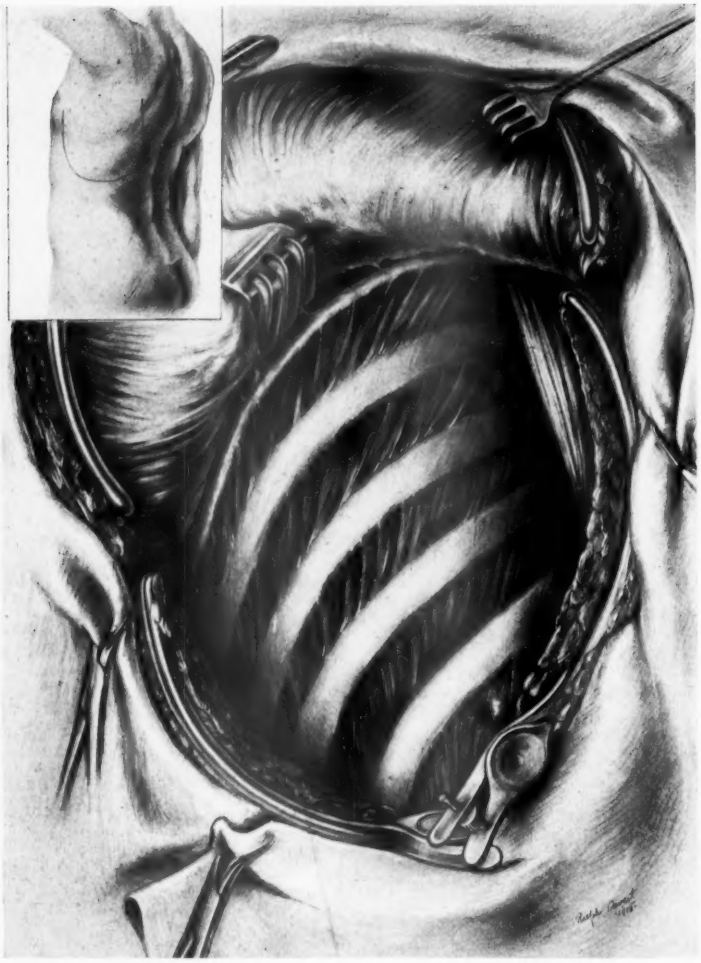

Fig. 11. Chronic empyema; cavity filling by muscle implantation combined with operation of Schede type. First step: Reflection of skin and muscle flap. Note curved clamps (without handles) to check muscle bleeding.

enchyma of the lung. In freeing these, lung tissue may be lacerated, causing bleeding and multiple minute air fistulæ. Hæmorrhage may necessitate the termination of the operation before the completion of the decortication; the degree of cavity filling is thus disappointingly minimized. Lung infection has resulted from the laceration of the peripheral air spaces. Fatalities have occurred from each of these complications.

If on the contrary the decortication is readily executed and the lung during a forced expiration of light anæsthesia appears to occupy the pleural space, the new relations are difficult to maintain. The lung may be temporarily inflated and forced even to approximation with the chest-wall, but in the presence of an open chest, neither negative pressure nor pleural capillarity are present to retain the expansion. To reproduce the nor-

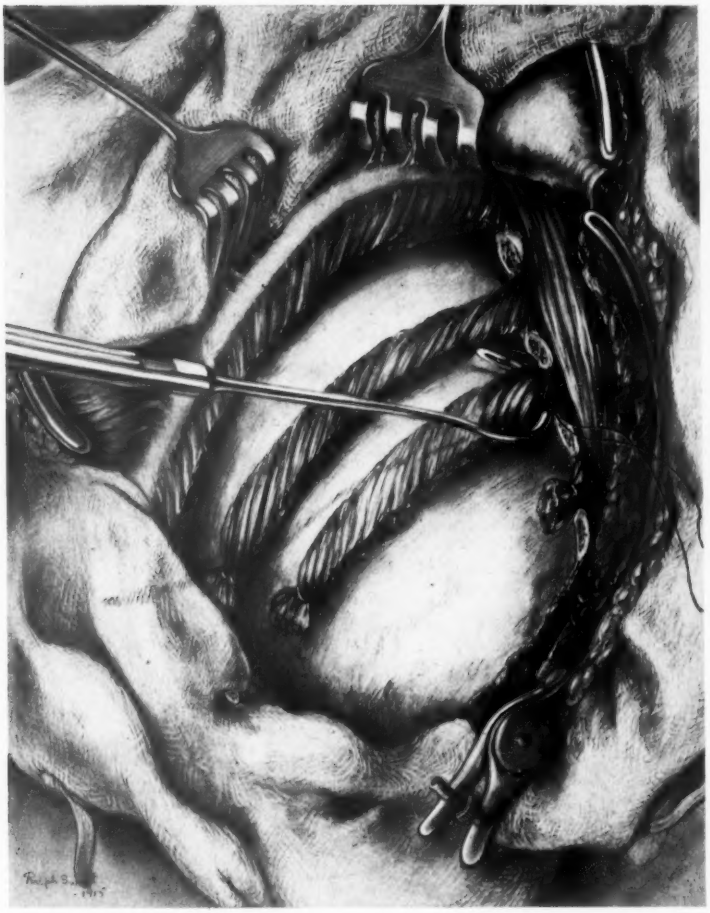

Fig. 12. Muscle implantation operation. Second step: Ribs have been resected subperiosteally. Ligation of intercostal bundles.

mal suction effect of the chest-wall, one must close hermetically the operative wound. By so doing one must also imprison infection within the diseased pleural cavity and local accumulations of pus are dangerously likely to occur. Efforts have been made to suture the inflated lung to the parietes, but unfortunately one secures apposition of suture lines rather than of surfaces. Pocketing of infection is again imminent. Positive pressure breathing exercises are religiously carried out during convalescence to maintain inflation but agglutination between the intermittently opposed surfaces does not willingly occur. The fibrous parietal pleura presents a slimy surface to which even the freshened surface of the lung may not adhere. The authors of the operation emphasized the necessity of removing both the visceral and parietal pleuræ in order that two raw surfaces might be brought in apposition. Surgeons of late years have rarely attempted the stripping of the parietal pleura. It prolongs an already severe operation and is generally omitted.

Fig. 13. Muscle implantation operation. Third step: Thickened parietal pleura in process of removal.

Decortication then, though in given instances of unquestionable value, has its limitations. It contributes to the cavity filling to a greater or less degree; it rarely obliterates it.

Inadequate as the osteoplastic resections and the decortications may sometimes appear, it must be admitted that what we have termed the filling type of operation is far more effective in obliteration than the shrinkage type. The use of foreign material such as paraffin for filling purposes has not been sufficiently successful to be convincing as to its value. The injected mass may at any time induce the signs of foreign body irritation. Deliberate transplants of fat or muscle have failed to graft. The blood supply of the fibrous pleura is far too meager to assume completely the nourishment of isolated tissue. If, however, muscle is swung into

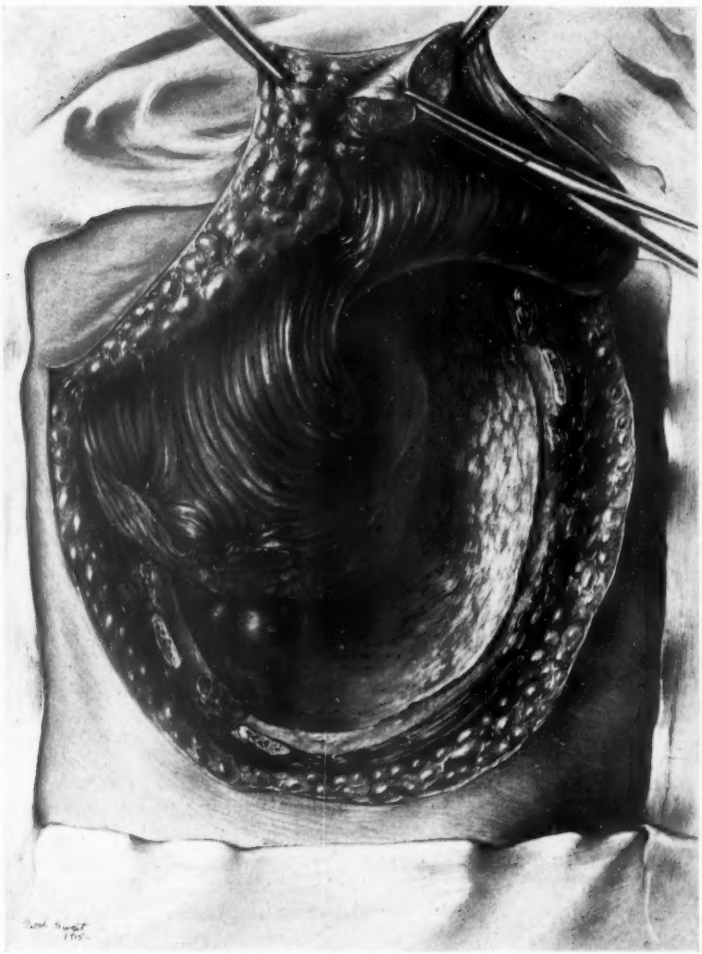

Fig. 14. Muscle implantation. Fourth step: Latissimus muscle has been split; one-half has been dissected from U-shaped flap and sutured into top of cavity; the remaining half is to be implanted likewise. Note important lateral sutures to muscle to relieve tension upon stitch at tip of flap.

an empyema cavity as a pedicled flap preserving its original blood supply, it can be relied upon as an efficient filling agent.

Schulten, Sudeck, Ringel, Korte, and Hellstrom have described operations which include the removal of portions of the scapula. In association with this they have utilized the remaining scapular muscles to aid in the filling of the empyema cavity. The excision of portions of the scapula is inadvisable for two reasons: Cavities can be obliterated without it; and with it is associated marked limitation in the movements of the shoulder-joint.

Figures 11, 12, 13, 14, 15 illustrate the several steps in the operation which I have performed with satisfaction. The operation is designed to combine the effects of the

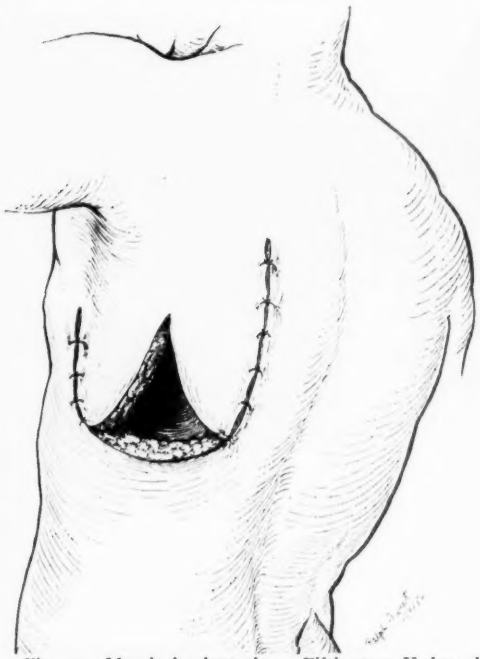

Fig. 15. Muscle implantation. Fifth step: U-shaped skin and fat flap has been restored. Triangular piece has been excised from border of flap to permit of free drainage, packing and stimulation of muscle granulations.

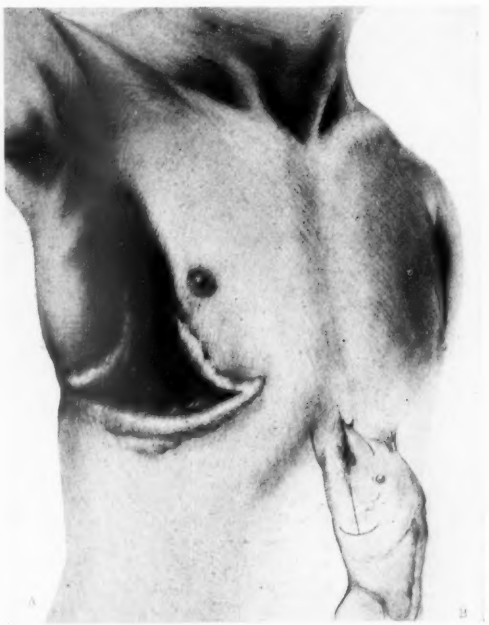

Fig. 16. A. The infolding of two lateral flaps. Ribs, intercostal tissue and parietal pleura have been removed. Flaps sutured to lateral walls of cavity. Cavity exposed for packing and stimulation of granulations and epithelial growth. Cavity also accessible for skin grafting. B. Illustrates inverted T-shaped incision producing lateral flaps.

Schede type of osteoplasty with the added filling tendencies of muscle implantation. Reference has been made above to the unwillingness of the restored skin and muscle flap in the Schede operation to slump into the unroofed cavity. It tends rather to bridge it. In Fig. 14 the Schede flap is turned upward exposing the section of the latissimus dorsi muscle which forms its inner surface. The muscle has been split; one-half has been sutured into the base and upper portion of the cavity; the other half remains *in situ* and will next be separated from the fat layer of the flap and likewise sutured to the floor of the cavity. If now the skin and fat flap should be stitched down in place it might again bridge as a tight membrane, leaving a new space between it and the implanted muscle. This skin and fat flap then is divided vertically. A triangular piece of the flap is removed from the curved edge (Fig. 15). The U-shaped flap is thus converted into two lateral ones. The newly incised edges can slump toward the depressed muscle to which they will again become adherent. Through the triangular wound the muscle surface and the unfilled lower portion of the cavity are accessible for cleaning, packing, and stimulation.

Let there be no misrepresentations regarding this method; it likewise has its limitations and discrepancies. The U-shaped flap even when cut to include a long tongue of the latissimus yet contains too little muscle to fill cavities of more than moderate size. In fact the muscle flap may be said never to completely fill; it merely occupies a greater portion of the cavity; there must be sufficient space around it for drainage of the temporarily persisting cavity secretions. From the nature of the discharge a few days after operation, it may be presumed that the buried tip of the flap is ill nourished and partially sloughs. Nevertheless much has been accomplished in

Fig. 17. Operation for obliteration of a chronic empyema cavity by the infolding of two lateral flaps produced by an inverted T-shaped incision through skin, fat and muscle. First step: Cavity being unroofed by the subperiosteal resection of ribs.

filling and at least two new muscle surfaces have been provided which unlike the fibrosed pleura will generously granulate and further hasten the obliteration of the cavity.

Yet one more scheme of operative treatment I mention because of its particular usefulness in certain instances. It was suggested by the observation of a small empyema cavity—the persisting portion of a huge cavity which had been subjected to several obliterating operations of different types. The stitches of the skin-flap had been removed prematurely after operation permitting retraction of the flap with complete exposure of the small cavity lying beneath. The pleural lining was at first gray and slimy, the secretion abundant and purulent. It was a most convenient wound to dress, a small gauze packed into the cavity was self-retaining. Eventually the leathery, unhealthy pleural surface acquired a granular reddish covering.

Balsam of Peru was added as a stimulant to granulation. The epithelium of the skin bordering the edge of the cavity was rapidly replacing the new granulations; the cavity was being skin lined—not obliterated. A local depression in the chest was present but complete healing was prompt, the patient having been particularly free from evidences of absorption during his convalescence.

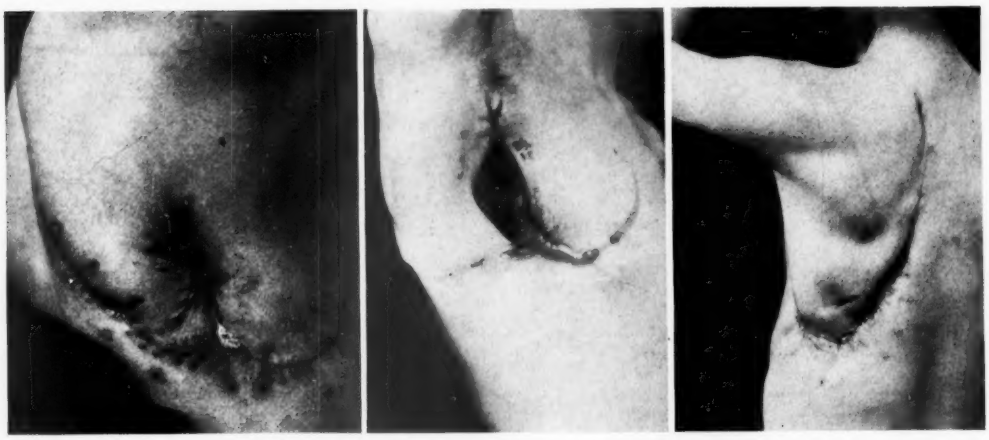

Fig. 18 (at left). Muscle implantation. Cavity of moderate size. Wound healed except over small granulating area representing remains of excised triangular segment of flaps (See Fig. 15).

Fig. 19. Operation by method of infolding lateral flaps (See Figs. 16 and 17). Cavity exposed for stimulation and grafting.

Fig. 20. Large lateral cavity obliterated in seven months by three operations of Schede type. Note elevation of shoulder and lack of extreme deformity.

In two subsequent cases larger cavities were intentionally left entirely uncovered. One was at first doubtful as to the safety of such exposure. Again in each instance the gray pleura took on a thin growth of granulations which might even have been skin grafted in addition to the epithelialization of the borders.

From these observations an operation was performed on three later cases such as is described in Figs. 16 and 17. They were high anterior cavities in which the clavicle and first rib restricted shrinkage and obstructed filling. A vertical incision was made across the lower end of which a shorter curved cut was added. The wound was thus inverted T-shaped (Fig. 16B). The two lateral flaps were then dissected from the chest-wall. The entire cavity was then unroofed of ribs as in the Schede operation (Fig. 17). The lateral flaps were laid over the rib ends in the fashion of the pathologist who would protect his rubber gloves from lacerations during post-mortem examination of the thorax. Interrupted silkworm sutures were placed to approximate the skin edges to the depths of the lateral walls.

It is quite obvious that the innumerable failures in the treatment of chronic empyema are not attributable to a paucity of methods. They are more probably due to an inaccurate conception of the type of cavity to be obliterated in a given case; to the choice of some one method ill adapted to the obliteration of a particular cavity; to lack of pertinacious persistency in executing the several stages of the several methods.

The obliteration of a chronic empyema cavity is a problem in mechanics. The equipment of many surgeons consists solely in a knowledge of the technique of some one of the standard operations. Such is inadequate for the proper handling of these cases. A discriminate combination of the more effective features of several or all the types of surgical treatment, effects most often a cure. For example, given a cavity of the type illustrated in Fig. 2. The cavity is first carefully outlined with the aid of the probe, the barium-soaked bandage pack, and stereoscopic radiography. A decortication operation is planned and executed. In the fourth week of convalescence the cavity is again outlined. The lung is found to have retracted again not to its original position, but to a disappointing degree. Two months are properly allowed to elapse to permit the normal shrinkage of tissues and to restore the patient to suitable resistance. An

Estlander or Wilms operation is then made to flatten the convexity of the ribs and to further shrinkage. Three or four months later the cavity is shown to spread over a smaller thoracic area; it is narrower and deep only in its central portion. A local filling method is chosen—perhaps of the Schede type or the latter combined with a muscle implantation—or with a skin lining procedure. A due interval is again permitted after which the degree of obliteration is determined. The barium pack may now outline a tube-shaped cavity of not more than three or four ounce capacity (Fig. 10). Such a cavity might persist for months; it is, therefore, injected with Beck's paste. Sterilization of the space occurs; the skin closes; nature may then be expected to complete the obliteration without incident.

By such a sequence of therapy a large chronic empyema cavity may be cured within 12 or 14 months. No operation has been of a dangerous magnitude because a surgeon conversant in the methods at his disposal realizes the necessity of the several stage campaign, and willingly closes each stage at the moment which is consistent with the prompt recuperation of the patient.

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## A PRELIMINARY REPORT CONCERNING THE EFFECT OF FOREIGN SUBSTANCES IN THE PERITONEAL CAVITY[1]

By WILLIAM R. CUBBINS, M.D., F.A.C.S., and JOSEPH A. ABT, M.D., Chicago

WE were stimulated to undertake the study of the effect of foreign substances in the peritoneal cavity because so many different things are advocated as of value in the treatment of acute peritonitis and in the prevention of adhesions, following operative manipulation or following acute inflammation of the peritoneum. As some of the agents advocated were violent irritants to most of the body-tissues, it was not quite clear to us why they should act as emollients to a membrane as delicate as the peritoneum. The substances so far used have been official tincture of iodine, reduced to one-half strength with 70 per cent alcohol, sulphuric ether of the type used for anæsthesia, commercial vaseline, liquid albolene, white vaseline, Russian mineral oil, olive oil, almond oil, lanolin. A great many of these substances have very similar actions which will be discussed later.

The first substance to be considered was iodine. The facts we aimed to determine with official tincture of iodine, diluted to one-half strength with 70 per cent alcohol, were:

1. Did it traumatize the peritoneum?
2. Did it inhibit the action of pathogenic bacteria in the peritoneal cavity?
3. Would adhesions be caused by its use?

It is very easy to determine by very delicate applications of the half strength tincture of iodine that it destroys the endothelium immediately, and in conjunction with a moderate amount of trauma results in diffuse fibrous adhesions, as shown in illustration (Fig. 3). Dogs averaging 20 pounds in weight were used in making these experiments. The animals were given one ounce each of the 3½ per cent tincture of iodine. They lived about eighteen hours, and at the post-mortem there was demonstrated a reddened granular peritoneum with 4 to 6 ounces of a brownish red fluid in the cavity. With each succeeding pair of dogs, two drams less of the mixture was used, and it was uniformly fatal until we used four drams of the mixture. About every other dog lived with this amount, provided there had been no manipulation of the bowels accompanying the use of the 3½ per cent tincture of iodine, but they were all very sick for several days following the operation. Figure 3 shows one of the animals that died 70 hours after four drams of tincture of iodine had been placed in the cavity — without manipulation. Out of twenty animals, two lived about three

[1] Read before the Chicago Surgical Society, November 5, 1915. (For discussion see p. 631.)

Fig. 1. Four drams of a 3½ per cent solution of tincture of iodine was placed in the peritoneal cavity of a dog, after the bowels were manipulated with gauze and glove. The dog was killed in three months, and the bowels were found matted together with firm fibrous adhesions.

Fig. 2. Four drams of a 3½ per cent solution of tincture of iodine was placed in the peritoneal cavity of a dog, without manipulation. The dog was killed after three months. There were numerous adhesions formed.

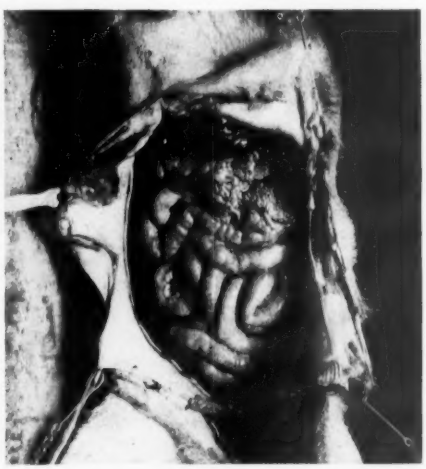

Fig. 3. Four drams of a 3½ per cent solution of tincture of iodine was placed in the peritoneal cavity of a dog. Death followed in 70 hours from diffuse peritonitis. At post-mortem there was found a thin reddish fluid which shows dark around the intestines. The intestines were firmly matted together.

months. The one with the trauma shows diffuse fibrous adhesions, which can be seen in Fig. 1; the other, in which the iodine was simply poured into the belly and the abdominal wound closed, shows firm fibrous bands between the loops of bowel (Fig. 2).

In addition to these experiments, 4 drams of the 3½ per cent tincture of iodine was mixed with 1 dram of pus and allowed to stand for thirty minutes. It was then placed in the abdominal cavity of a dog. These animals died in 16 to 24 hours of diffuse general peritonitis. The iodine seemed to aid and abet the bacteria instead of inhibiting their growth. Five animals were treated in this manner, and the following conclusion concerning the use of iodine in dogs reached:

Iodine is an intense irritant to the peritoneum and favors rather than inhibits bacterial action. It will produce firm fibrous adhesions, either with or without any manipulation of the peritoneum.

Fig. 4. One ounce of ether was placed in the abdominal cavity without asepsis. The intestines were handled for one-half minute. Death followed in seventy-two hours, from diffuse fibrinopurulent peritonitis.

Fig. 5. One ounce of ether was mixed through the intestines with the finger. Death followed in ninety-six hours from severe diffuse peritonitis of a hæmorrhagic type, as shown in the picture.

The next substance experimented with was sulphuric ether for anæsthesia. The animals used in this series of experiments averaged about 15 pounds in weight. The facts we tried to determine from the use of sulphuric ether were:

1. What anæsthetic effect did it have?
2. Did it cause shock?
3. Did it have a post-operative analgesic effect?
4. Was it irritant to the peritoneum causing either fibrinous or fibrous adhesions?
5. Would ether inhibit virulent pus, if mixed with pus before being placed in the cavity?

It was very easy to determine that one ounce of sulphuric ether in the peritoneal cavity of a 15-pound dog had an intense anæsthetic effect, exactly similar to intravascular anæsthesia; that unless the animal was allowed to waken before putting the ether into the belly, and the belly held open so that the ether vapor could escape, the animal would die from the anæsthetic effect within three to five minutes. The pouring of the ether into the belly of the semiconscious animal as a rule caused the bowels to writhe and twist, and the temporary awakening of the animal with cries of pain was the common occurrence. This was followed by a deep anæsthesia, although there were variations in these two conditions, sometimes there being no irritant effect to the animal upon the application of the ether to the peritoneum, and in others there seeming to be very little anæsthetic effect.

As ether cannot be poured into the belly at a temperature above 88 degrees, when it is a vapor, at that temperature it is cold to the peritoneum and will produce a certain

Fig. 6. One ounce of ether was placed in the peritoneal cavity under aseptic conditions. The dog was killed six weeks later. There were found fibrous adhesions of the bowels to each other and to the abdominal wound.

but variable degree of shock, the exact amount of which I have not determined. The rapid evaporation will also reduce the temperature of the bowel, as can be shown by introducing a thermometer or the hand into the belly against the cold peritoneum. If the cavity is not closed within seven minutes, no ether remains, as it evaporates very rapidly. It was nothing unusual during the evaporation to have a loop of bowel or the omentum extruded from the wound by pressure of the ether vapor before the wound could be closed.

There was no analgesia noticeable following the experiment, as the animal seemed to be far more restless and uncomfortable than the other experimental animals, but that is a question of judgment which is capable of wide variation.

The local effect on the peritoneum was not dissimilar from that of handling or exposure to air. It is not nearly so violent an irritant as 3½ per cent tincture of iodine. When the peritoneum is manipulated with the gloved hands and gauze sponges and ether applied, there is not much more trauma than one would expect with manipulation alone; but the ether did seem to have a very marked effect in reducing the resistance of the peritoneum to infection.

In Figs. 4 and 5 we see the effects of handling the intestines under conditions which were not clean, and then putting ether into the belly. These animals died, one in 72 and the other in 96 hours, and each shows violent peritonitis. Figure 4 shows a fibrinopurulent condition with pus down in the right side of the belly, which gives a highly refractile edge. Figure 5 shows a diffuse fibrinous peritonitis of a hæmorrhagic type.

These two experiments are examples of about 25 experiments under relatively similar conditions, in which we were endeavoring to

Fig. 7. One ounce of ether was poured into the abdominal cavity, under aseptic conditions. The dog was killed three months later, and fine fibrous adhesions were found between the loops of intestine.

determine if ether would have an inhibitive effect upon any infection introduced into the peritoneal cavity; but these experiments have shown that any carelessness in asepsis with ether brings on a fatal result in from 24 to 92 hours. Not one of our animals survived if the placing of the ether in the peritoneal cavity had been accompanied by unclean manipulations of the bowels. This was also true where ether was mixed with pus and allowed to stand one-half hour previous to its being placed in the peritoneal cavity. In the aseptic operations in which ether was placed in the peritoneal cavity, the animal stood it much better, about every other one living. When the ether was placed in the belly, after the intestines had been manipulated with the gloved hands from thirty seconds to one minute, adhesions followed of the type illustrated in Fig. 6. It will be noted that

Fig. 8. The dog was killed eight days after two ounces of sterile vaseline had been placed in the abdominal cavity. The bowels were found to be matted together and in the lower portion of the cavity there was a reddish fluid with lumps of vaseline.

Fig. 9. The intestines of a dog which was killed three months after two ounces of vaseline was placed in the abdominal cavity. The bowels were firmly matted together with fibrous adhesions and pockets of vaseline were found between the loops. There was very little, if any, absorption.

there are firm fibrous adhesions uniting a loop of bowel to the mesentery of another bowel.

In Fig. 7, we see the result that ether will produce where it is poured into the belly without manipulations of any kind. However, the result shown in Fig. 7 is not always present. In about one-half of the number of cases in which ether was put into the belly without manipulation and the animal recovered, there were no adhesions or any marks of trauma of any kind. However, it is well to state here that we had a mortality very close to 40 per cent after putting ether into the belly without any manipulations, and that half of the number of dogs which survived had adhesions, and half did not. These adhesions were always of a fine, hair-like type, as shown in the illustration.

From these experiments we cannot see the value of the use of ether in the peritoneal

Fig. 10. Four ounces of paraffin oil was placed in the abdominal cavity, and there was no absorption at the end of six weeks. There were firm adhesions at site of the abdominal wound.

Fig. 11. In this dog paraffin oil was inserted without trauma. The paraffin caked on the spleen but there were no adhesions.

cavity, and it is our candid opinion that individuals in whom it is used will recover in spite of it and not because of it.

The next substance with which we experimented was ordinary yellow commercial vaseline. Vaseline has gained considerable reputation as an emollient for its favorable action upon the endothelium of blood-vessels and the non-irritating qualities that it has upon granulation tissues of burns or abrasions. We have conducted nine experiments using vaseline in the abdominal cavity and endeavored to determine four things:

1. Was it an irritant?
2. Was it absorbed?
3. Did it prevent infection?
4. Did it tend to prevent adhesions?

In each case in which vaseline was put into the belly of an animal, the animal was violently sick. Two animals died in about 48 hours of intussusception of the bowels. The peritoneum was reddened, swollen, and inflamed throughout. There was free and bloody fluid in the peritoneal cavity, the peritoneal cavity appearing very much as is shown in Fig. 8, of an animal that was killed on the eighth day. Here the bloody fluid is shown as a dark area in the lower part of the belly, with the highly refractile lumps of vaseline lying in the center of the fluid. One dog, which lived three months and was killed, shows the matting together of the bowels with firm fibrous adhesions, with pockets of vaseline in between each loop of bowel (see Fig. 9).

From these experiments we conclude that vaseline is an intense irritant to the normal peritoneum of a dog, and that it is absorbed very slowly, if at all. We have had two cases of vaseline in the peritoneal cavity of humans, in which it was necessary to open the belly and allow the vaseline to escape practically in the same condition as it was when it had been put in three and four months

Fig. 12. The loops of bowels were traumatized, and then a thin layer of paraffin oil was put over the area of trauma. Firm adhesions formed between the loops.

Fig. 13. Dog killed six weeks after two ounces of paraffin oil and a sponge had been placed in the abdominal cavity. The sponge was found on post-mortem to be surrounded by firm fibrous adhesions and was lying in a lake of yellowish looking fluid.

before. The walling-off of the vaseline in the belly of these two humans was just as firm as if it had been around an abscess.

I did not mix vaseline with an infection of any kind, as it seemed to be deadly enough when used in any quantity at all without the increased danger of an infection.

White vaseline, albolene, and lanolin all seemed to have a very similar irritating effect.

The next group of experiments were conducted with Russian mineral oil, which was imported before the outbreak of hostilities. The facts we wished to determine with this oil were:

1. Did it irritate?
2. Was it absorbed?
3. Would it cause adhesions?
4. Would it prevent adhesions?

This substance was used in the bellies of 16 animals, and it did not seem to have an irritant effect in any one of the experiments.

Figure 10 is the picture of an animal in which we put 4 ounces of paraffin oil under aseptic conditions. At the end of 6 weeks, the oil is present in practically the same quantity that it was put in, and in no places was the peritoneum reddened, inflamed, or irritated in any way. There were firm, fibrous adhesions to the abdominal wound.

In Fig. 11 we see the effects of a smaller amount of oil. Here it cakes on the spleen as a white mass, while the peritoneum beneath it is perfectly normal.

In Fig. 12 can be seen a loop of duodenum firmly adherent to jejunum. These two loops of bowel had been handled with the gloved hands for about thirty seconds. They were then smeared with paraffin oil, after which one ounce of paraffin oil was placed in the abdominal cavity. While there is no free oil in the cavity, the use of the oil did not prevent firm fibrous adhesions. We then took a gauze sponge, soaked it in sterile paraffin oil, and placed it in the belly with about one ounce of paraffin oil, in addition to that which was in

Fig. 14. Two ounces of olive oil was placed in the peritoneal cavity, without trauma. After six weeks the oil is seen as a milky fluid on the spleen.

Fig. 15. Olive oil was smeared as a thin layer over the peritoneum after handling for one minute. The dog was killed in three months. There were few fibrous adhesions.

Fig. 16. Two ounces of olive oil was placed in the peritoneal cavity after trauma. Twenty-two days after operation there were firm fibrinous adhesions.

the sponge. This was done under aseptic conditions. The animal was killed at the end of six weeks and the sponge was surrounded by firm fibrous adhesions, and lay in a lake of yellowish looking fluid. This can be seen in Fig. 13. We did not try to use the paraffin oil with infection, so that we cannot say whether it will, or will not, prevent a peritonitis.

The things that we were able to determine were that paraffin oil is relatively non-absorbable, and that it will not prevent adhesions, although it is far less irritating to the peritoneum than vaseline.

We next experimented with the olive oil and endeavored to learn:

1. Was it an irritant?
2. Was it absorbed?
3. What was its action with trauma in the peritoneal cavity, and what was its action without trauma?

Olive oil in the free peritoneal cavity without trauma, is non-irritating and slowly absorbed. In Fig. 14 we see the milky white oil through the peritoneal cavity six weeks after one ounce had been put in under aseptic

conditions, as is shown by the white droplets on the spleen. A similar condition was found in the rest of the abdominal cavity, but it does not show as distinctly as it does on the spleen. There were no adhesions, except to the abdominal wound, where it had no effect on the production of firm, fibrous adhesions.

Figure 16 is an illustration 22 days postoperative of the effect of trauma with olive oil smeared over the traumatized area, and one ounce of olive oil placed in the peritoneal cavity in addition. There were firm, fibrinous adesions between these loops of bowel, and the oil was still present, some of which can be seen, as a white mass, on the edge of the liver at the upper angle of the wound.

In Fig. 15 are some fibrous adhesions between two loops of bowel, which were manipulated for 30 seconds with the gloved hands smeared with olive oil, after which one ounce of olive oil was put into the peritoneal cavity. There are a few fibrous adhesions between these loops of bowel; but there is no free oil in the peritoneal cavity, as we saw in the other experiments of 22 and 42 days each.

Olive oil seems to have very little, if any, irritating effect upon the peritoneal cavity. In only two of the animals experimented upon, in which trauma was used and olive oil used as a preventative to adhesions, did adhesions fail to form. In other words, in about 20 per cent of the cases, adhesions did not form when olive oil was used, but they did form in 80 per cent.

From these experiments I would conclude that olive oil has little, if any, value in preventing adhesions, although it has little or no irritating effect upon the peritoneum.

We are making another series of experiments with different fats, oils, and blood, which will be reported at a later period.

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# PSYCHIATRY AND GYNECOLOGY[1]

By FRANCIS M. BARNES, Jr., M.D.
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## I. Introduction

DURING the past several decades the relations which disease or dysfunction of the female generative organs may bear to mental disorders have been subjected to much observation, research, and discussion, by both gynecologists and psychiatrists. The charge has been made (1) that there has been too little teamwork between the followers of these two specialties and that, therefore, extremists have advanced their antipodally variant views, the midground of common belief having been neglected. If this is true, it would appear to have been a wise thought which has lead to this joint meeting of our two societies here on this occasion for an interchange of viewpoint and experience.

It is some thirty years since Battey in this country recommended the castration of females as a cure for their mental disorder. For some years following this therapeutic suggestion men performed many useless, and, it may be said, even harmful mutilations of the female genital organs. Some years later Rohé (2) and Hobbs (3, 4) published the results of their observations along this line and the latter says: "The results following operative treatment have exceeded expectations. Not only have the majority of the cases treated been restored to physical health but as a sequence, in a large percentage, their mental condition has been brought up to par." Rohé states: "That derangements of function or structural alterations in extracranial organs may reflexly irritate or depress the cortical functions I venture to believe," and Hobbs further states: "those organs concerned in the reproduction of the species are more closely related to the great nerve-centers than any other part of the organism." Such were

[1] Read at the joint meeting of the Gynecological Section of the St. Louis Medical Society and the Neurological Society of St. Louis, October 19, 191

the tenets of belief which served as the fundamental basis upon which Rohé and Hobbs conducted their work. Among others who supported and still do support such contentions was Schultze (5). Russell (6) criticized severely the work of Rohé and Hobbs and brought forth a group of collected opinions to substantiate his objections. Manton (7) went so far as to state that: "In not a single asylum case could insanity be traced solely to abdominopelvic disease" nor could a single cure of mental disease be attributed to the effect of an operation alone. More recently a most ardent advocate of the belief that almost all human ills in the female, and particularly mental, are caused by gynecological disorders has appeared in Italy in the person of the gynecologist Bossi (8) of Genoa. For some years past Bossi has fanned into a flame a most active propaganda, not only among the medical profession but even among the laity, his photograph and creed appearing recently even in the magazine section of our own Sunday newspapers. We all know how common, too common indeed, is the belief that pelvic disorders are the chief cause of insanity among women. At least a partial explanation for this belief may be found in the observation made since the beginning of medical history that psychoses appear to develop more frequently in women at puberty and the menopause, and that in normal women psychic disorders do sometimes become apparent in association with the menstrual period and pregnancy.

Most psychiatrists cannot see in gynecological disease or disorders the enormous etiologic agents which some gynecologists have claimed. More recently indeed, most gynecologists have adopted a more conservative attitude as shown in the paper of Taussig. With occasional exceptions, all are more of the opinion now that "there is, however, no mysterious or specific connection between the genital organs and the central nervous system. There is, on the other hand, between the two exactly the same relationship that exists between the brain and every other area of the body and the laws of pathological action and reaction are exactly the same" (1).

After this somewhat general survey of the subject we will now undertake a more detailed consideration of its individual phases. What I will have to say will relate primarily to the true psychoses alone. Except for occasional mention, what are commonly known as "nervous diseases" will not be considered, as such will be the subject of another contribution to this program.

## II. The Theories of Mechanisms of the Relationship of Genital Disease or Disorder to the Psychoses

### A. The co-ordinate, superordinate, or subordinate character of this relationship

The relationship of genital to mental disorder may be threefold: the genital disease or disorder may be co-ordinate, superordinate, or subordinate considered in reference to the psychotic manifestations where these present themselves. There is hardly any question raised concerning their co-ordinate or coincidental occurrence in a given individual. Genital disease is negligibly more frequent in insane than mentally normal women. It is not questioned but that in many instances the occurrence of genital disease in insane women is merely incidental and in nowise causal. At the same time, it should be mentioned that an accurate evaluation of the elements of cause and effect has not been made always where disease in these two systems has been found coexistent. Hence the difficulty in determining this question of superordination and subordination has arisen. Possibly gynecologists are more inclined to look upon the genital disorder as superordinate while psychiatrists are wont to place it in a more subordinate position. Of course, we do not mean to infer by this statement that we believe a mental disorder can be the cause of a tumor or malposition. Reference is made rather to functional disorders, such for instance, as a disturbed menstruation. For example, in the absence of organic disease of the genital organs, when amenorrhœa occurs in conjunction with psychosis, are we to suppose the amenorrhœa is caused by the psychosis, or the reverse, or either? We shall have occasion to return to this later.

### B. THE THEORY OF REFLEX ACTION

To proceed with the theories of the mechanisms of relationship which have been claimed to exist between mental and genital dysfunctions, the first which we will consider is at the same time the oldest—the reflex action of the genital organs, and particularly in diseased states, upon the nervous system. Pinel has stated (9) that the primary seat of mental alienation is generally situated in the region of the stomach and intestines and that from such center the disease propagates itself, as it were, by irradiation, and deranges the understanding. Rohé clearly states his belief in this theory when he says "that derangements of function or structural alterations in extracranial organs may reflexly irritate or depress the cortical functions . . " In some instances (10), no doubt, the use of the term reflex was intended to convey the meaning of an intoxication or similar process depending upon the local disease; i.e., reflex meant indirect. However, it would appear that not too infrequently reflex was used in the manner of Pinel and meant about the same as idiopathic does to us; unknown. At all events, it appears today that any such use of the term reflex is but a useless cover for speculation, and in fact it has largely disappeared and has been supplanted by more modern conceptions which we shall mention in greater detail under the next three headings.

### C. THE THEORY OF PSYCHOGENIC ACTION

The rôle of psychogenic factors in the production of a certain class of functional psychoses has been more closely investigated and emphasized in recent years than formerly was the case. Faulty mental mechanisms working upon hyperquantivalent ideational constellations are seen not infrequently to lead to the development of a true psychosis. More frequently, perhaps, neuroses owe their existence to such origins. Walthard (11) particularly has called attention to what he has termed the "genital psychoneuroses" and emphasizes the fact that in these the pathological mental habit is primary, that is to say, sensations referable to the genital organs are perceived and an overvaluation of their significance is placed upon them. Carstens (12) and Dercum (13) also have pointed this out. The causation here may be purely psychic, ideational, for as Walthard points out, such conditions are equally frequently found in women with sound, diseased, or removed pelvic organs. As the psychogenic factor is probably more prevalent in the production of psychoneuroses than psychoses we will leave this without further comment at this time.

The last two possibilities—toxic and endocrinic—are the most important in our discussion. They are the more prevalent and are receiving the greatest attention at the hands of gynecologists and psychiatrists at the present time, perhaps it may be, more by the former than the latter.

### D. THE THEORY OF INTOXICATION

The possibility of the causation of mental disorders by intoxications arising from diseased conditions of the genital organs brings us to the particular consideration of the work of Bossi as he is no doubt the most ardent advocate of this theory as well as one of the most recent writers in this field. According to Bossi it is not carcinoma, myoma, or other serious organic disease which bring about the intoxication but rather the more benign conditions, such as endometritis, cervical lacerations and erosions, menstrual disorders, malpositions, etc. It is no new idea that such minor local conditions might be the cause of mental disorder. Griesinger (14) called attention to the frequency of hysteria attributable to such anomalies. Kraepelin (15) likewise notes the same but qualifies his statement by adding that such diseases of the female genital organs only cause psychoses when a constitutional predisposition to mental disorder forms the soil. Prichard refers particularly to psychoses caused by menstrual disorders. However, Bossi is more explicit in stating the mechanisms by which such disorders cause psychoses. To him psychoses are the expression of cerebral intoxication from the genital apparatus. The menstrual discharge is a purification and, therefore, in amenorrhœa there is a retention of toxic matter. Also,

infectious endometritis produces cerebral anæmia or congestion. There has been no proof of the toxic character of menstrual discharge and we know entirely too little of cerebral anæmia and congestion to speculate upon such changes in vascular supply as the causes of psychoses. To understand by just what physiologic process such local disorders in the genital apparatus can bring about such toxic or vascular disturbances intracranially is, to say the least, difficult. Furthermore, assuming that such conditions were thus occasioned, why is it, may one ask, that disease in other viscera, such as the heart or liver, does not occasion similar disturbances in cerebral vascular supply? Or, if it does, and this is not an unreasonable assumption, why are psychoses due to such conditions so infrequent? Why do not infections in other organs or parts of the body exert more frequently a toxic etiologic influence in the production of psychotic disorders? To be sure, we do meet with psychoses which we attribute to disease of other organs than the brain, such as the deliria depending upon general infections, as typhoid or influenza, psychotic states associated with nephritis, cardiac disease and the like. Also, we must recall here the psychoses which develop in relation to infection or exhaustion incident to the puerperium. All of these are fully recognized and properly spoken of under the collective term, "symptomatic psychoses" (16). But in these we have some semblance of a logical connection between cause and effect. Furthermore, they constitute but a small percentage of the total number of psychoses met with, whereas Bossi would attribute practically all psychoses in women to gynecological disorders. The severe and carefully analytic criticism (29, 37) to which Bossi's work has been submitted, both by gynecologists and psychiatrists, makes it unnecessary to go into further detail at this stage.

E. THE THEORY OF ENDOCRINIC GLAND ACTION

"It must be evident to everyone that there reigns the greatest confusion on the subject of the functions of the glands of internal secretion" (17, 18). Any yet, when we read the papers written by some of our gynecological confreres, especially those of W. Blair Bell (19), how comparatively simple it all appears to be. It used to be thought that a woman was a woman because of her ovaries alone while now it is said (19) that the potentiality to produce femininity "is directed toward the future development and correlations of the endocrinous glands which are to control the sexual evolution of the individual." From a disturbance due to disorders in but a single gland (ovary) we have substituted the theory in its pluriglandular aspect. It is true that "much evidence has been accumulated to show that diseases of the ductless glands are usually plural rather than isolated and single" and that "there are two forms of endocrinic disorders—organic and functional" of which, fortunately, the former are rare (20).

Among some of the statements made by Bell concerning the rôle of certain endocrinic glands in the production of disorders in function and the treatment which is, according to him, physiologically indicated, the following are interesting examples. The hyperfunction of the ovaries and thyroid (but which causes the other is speculative) produces menorrhagia. The treatment is, therefore, simple; counterbalance these hyperactivities physiologically by giving extract of pituitary and adrenal and perhaps add a little calcium lactate. In another place he states that the pubescent psychoses (*sic*)! are often due to disorders of menstruation; there is too little or too much flow. He would give pituitary for the latter and thyroid for the former. We learn that hystero-epilepsy is due to the depletion of lime salts from the tissues; *ergo*, calcium lactate and pituitary are indicated. Also, that the psychoses which occur at the menopause are often greatly relieved by thyroid, or in cases where this is not efficient one may try pituitary plus ovary. In the psychoses which occur during pregnancy and parturition, thyroid may be given with the greatest benefit. It is not the place, nor does space permit us, to comment upon the ideas expressed in the foregoing paragraph.

Bossi has not yet arrived at the pluriglandular stage of development in his theories.

Therefore, simplicity, superficially at least, is evident in his statements regarding the internal secretion of the ovaries. A hyperactivity causes states of mania while a hyposecretion leads to melancholic conditions of mind. He appears to forget that we have definitely known and recognized mixed states, especially in manic depressive insanity. And how are these to be explained by internal secretory disorders of the ovary? Are we to suppose that the secretory activity varies from one moment to another or that one ovary exhibits hyperfunction while the other is putting out less than normal secretory products? Is there in reality any basis in fact for the belief that ovarian dysfunctions can act to produce true psychoses? The recent study by Gordon leads to the conclusion that there is none. Others (21) likewise conclude that such psychoses as develop at puberty and menopause (natural or by castration) do not have their cause in the disturbance in the sexual gland activity but that these life epochs are but accessory moments acting upon a labile brain. Of the cases studied by Taussig a proportionately small number (10 per cent) developed psychoses at the time of puberty or menopause. As Hyslop (22) says "The rôle of the internal secretions in their causal, coincidental, and sequential relationships to mental disorders has already received a considerable amount of attention," and as yet the balance of opinion is against the belief that disturbance of the internal secretion of the ovary can be the direct cause of any of the true psychoses. That disorders in some members of the endocrinic system do produce marked and evident changes in mental states we cannot deny. It is only necessary to recall to mind the picture of the active, excitable, restless mental state associated with hyperthyroidism and the opposite phase as seen in cretinism and myxœdema. But we are unable to point to any such definite condition wherein only the ovaries are involved nor by the mental symptoms alone are we able to predicate an increase or decrease in ovarian internal secretory activity. That the glands directly associated with the generative system may play some part in relation to certain psychoses may be true, but in what way this may be we are not in a position to state at present. One suggestion is that these two systems, the generative and the nervous, may best be considered for the time being as reciprocally stimulating. Also, another viewpoint which must not be clouded is that these glands may act more indirectly than we are aware. For instance, this action may be by the production of some change in the body metabolism which in itself secondarily leads to the appearance of mental disorder.

It would not be proper to leave this section without a brief mention of the support which may be offered the endocrinic theory of the causation of mental disorders by the results of the study of mental diseases by Abderhalden's method (23). It is no new idea that dementia præcox in some way is dependent upon some disturbance within the realm of the genital glands. It has been thought, for instance, that disorder in these glands lead to disturbances in general metabolism, especially in reference to certain inorganic salts. It is, perhaps, a striking observation that in dementia præcox dialyzation against genital glands (ovaries or testes) has given, in the hands of some, a wonderfully high percentage of positive returns. It is assumed that this indicates some kind of destruction of the constituents of the glands in question, the products of which, reaching the blood, may be recognized by this technique in the serum.

But, on the other hand, when we come to look at the mental diagnoses made by those who have favored the idea of the genital origin of mental disease we are confronted with a large proportion of the acute insanities, and especially is manic depressive psychosis mentioned as among the most frequently met with (24, 25). And yet with the Abderhalden test it is the manic depressives which give practically always negative findings. To be sure, it is realized that the Abderhalden test cannot, in so far as the pathogenesis of the psychoses is concerned, be looked upon as of final value. Yet, if any such speculative support is to be brought forward it will be found to aid the belief that the genital glands or their internal secretions,

or disorders of either, are not as yet shown to be a direct cause of mental disease.

## III. Data of Observation and Research Offered in Support of the Theories above Discussed

### A. Statistical Data

1. *Ratio of female to male insane.* If gynecological disorders play such an exclusive rôle in the production of mental disease as Bossi would have us believe, or even a lesser rôle as other supporters are inclined to claim, what effect might we expect this to have on the relative number of male and female insane? If we refer to some of the older data (26) we find varying statistics given by different writers for different countries, these variations probably largely to be explained by the inaccurate collection of information. If we refer to the last census of the United States (and in this a special attempt toward accuracy regarding the insane was made) we find that insane males are in the majority (27). They are also in the majority in the total population of the United States but not to so marked a degree. In the total population there are 106 males to 100 females; in the institutions for the insane the ratio is 110.8 to 100; and among the admissions to such institutions it is still higher, being 128 to 100. In proportion to the total population the males admitted during the year 1910 represented a ratio of 72.1 per 100,000 and the females a ratio of 59.7 per 100,000. Another interesting point brought out is that in no age period is the ratio of admissions as high for females as it is for males. That is, even the supposed influence of the climacteric toward the production of psychoses is not here sufficient to produce more insanity in females than males of similar age groups. It is interesting to note, that in 1910 Missouri was one of only four states in which the ratio of admissions was higher for females than for males, although in proportion to population there were more male than female insane in institutions on the first day of that year. From these statistics, the conclusion seems justified that women, because such, are not only not more prone to the development of mental disease than are men but to the contrary less so.

2. *Frequency of gynecological disorder in sane and insane females.* 3. *Character of gynecological disorder in the insane.* If genital disorder is to be considered a prime etiologic agent in the production of insanity in females would we not expect to find it more frequently present in the insane than the sane woman? The question first arises as to what shall be considered a gynecological disorder in this connection—a question which we must leave to the gynecologist himself. Apparently there is some difference of opinion on this point. Bossi would have every insane woman and half of the female suicides gynecologically abnormal in some respect. Hobbs found pelvic disease in 93 of 100 insane women examined. Rohé found that "systematic observations seem to show that insane women do suffer in larger proportion from pelvic disease than sane women do," 60 per cent in his cases, though not always requiring treatment. Topler (28) found 50 per cent of women with mental symptoms at the menopause had gynecologically normal pelvic conditions. Taussig says 47 per cent of insane women are abnormal gynecologically, only slightly more than not insane women. Koenig and Linzenmeier (29) give 35.9 per cent gynecologically abnormal in their series and further state that 50 per cent of these were found in the psychoneuroses. Bumke (30) found the gynecological condition to be the same in normal as in insane women. It would appear, therefore, that gynecologists who have interested themselves in this work in recent years are fairly uniform in the opinion that, comparing sane with insane women, there is no great difference in the incidence of gynecological disease or disorder. And, moreover, the opinion is practically unanimous that it is the milder, more benign types of gynecological trouble which are met with in insane women and not the more serious and severe organic diseases.

4. *Result of gynecological treatment determined by the number of mental recoveries and improvements.* What has been the effect of the introduction into insane hospitals of gynecological procedures as shown by the

cure of the mental disease? One of the most obvious ways to determine this would appear to be by a study of any change in the discharge rate of insane females after the introduction of gynecological procedure as compared with the rate before that time. This method has been resorted to by many. It has been claimed that the recovery rate as a result of gynecological treatment, including here the improved cases, has ranged from 50 to 60 per cent. Hobbs states that, for a period of five years after the introduction of gynecological treatment, discharges increased in women by 35 per cent. It has been pointed out (31), however, that, contrary to these older experiences, the records of various large hospitals for the insane do not show any such increase in the discharge rate of females following the rather general introduction of gynecological treatment in such hospitals.

A more important factor in the consideration of this phase of the subject depends upon what the type of the psychoses is and what are to be the criteria of cure. In all papers on this subject appearing prior to the last two decades the question of the diagnosis has been one of difficulty. By many, if not most, observers symptoms of mental disorder have been accorded the dignity of a diagnosis. Thus we find such diagnoses as acute, chronic, and epileptic mania, acute melancholia (Hobbs), puerperal insanity, hysterical mania (Rohé), suicidal mania (Bossi) and similar terms. It was not recognized that an excitement or depression might occur as the most manifest symptom of a mental disorder which might in turn rest upon either a functional or organic basis. More recently Gibson has recognized the advisability of separating certain organic from the functional psychoses and, therefore, divides mental diseases into two groups. The first, psychoses with dementia, such as dementia præcox, paresis, epilepsy and senile dementia. The second, without dementia, including manic depressive insanity and allied forms and "paranoiac conditions." His observations accorded with his expectation that in the first group he would find no improvement in the mental condition as a result of gynecological treatment. He agrees with the conclusion of Taussig regarding the relation of gynecological disorder to manic depressive insanity as follows: There is a greater frequency of such disorders in cases of this mental type than is true with other psychoses, and especially is the large proportion of chronic infective conditions of the genital organs prominent. Also, the proportionately large percentage of mental recoveries after gynecological operations in the manic depressives is taken as significant. Taussig found gynecological disorders of one kind or another in seventy-four per cent of his manic depressive cases and quoted Broun as reporting 70 per cent of recoveries after operation in these cases thus supporting his somewhat similar experience. It is certainly significant to note that in those cases more uniformly recognized to have benefited from gynecological treatment, in so far as can be ascertained from the diagnoses at least, we have to deal with the more acute mental disorders or with the more manifestly acute symptomatic expression of these, in either instance, more or less self-limited outgrowths of psychic instability. This statement applies equally well to the older and more recent contributions to this subject.

What are we to consider a mental cure or improvement? What causal relation, if any, does the gynecological treatment bear to the change which may coincidentally occur in the mental state? If the acute mental state symptomatic of an underlying dementia præcox, paresis, or cerebral arteriosclerosis is replaced by a condition of quiet and dullness incident to an advancing dementia we are hardly justified in counting this as an improvement and less so as a cure. Possibly from the custodial viewpoint it may be an improvement but most emphatically and certainly neither an improvement nor a cure from the prognostic side. We have ceased speaking of psychoses developing during the puerperium as entities under the term puerperal psychoses. But even if, for the moment's convenience, we retain this term with its older meaning, it is not surprising that the treatment directed at the local condition would be of benefit to the individual as a whole. It is common medical

practice to attack infection at its seat and as Carstens says (perhaps with some exaggeration), "Puerperal insanity is puerperal infection in 90 per cent of the cases." We treat other psychoses resulting from infection by drainage of the focus and why should wonder be aroused when the puerperal uterus, being the locus of infection, is treated in a similar manner with good results? Is not such an attitude uncritical and dependent upon a narrowed or prejudiced viewpoint? In commenting upon the large percentage of recoveries in manic depressive insanity following gynecological treatment does not the gynecologist lose sight of the fact that this is the recoverable psychosis *par excellence?* And in marking these recoveries down to the credit of repaired gynecological conditions is not the time relation as well as the natural tendency of the psychosis to recovery overlooked? We must remember that we have manic depressive patients who have repeated recurrent attacks throughout life. Moreover, such attacks are often similar in symptomatology and duration, and in the interval between them the mental state is normal in so far as we are able to determine. Suppose we take a case in which previous attacks have averaged four or five months in duration, which is about the average of all cases. Now, if after a given attack has been present for three months, suppose a month or so following a gynecological treatment recovery takes place mentally. Are we not stretching our statistics when we record this recovery to the credit of the local treatment alone? Or again, in so-called hysterical psychoses, where reputed recovery takes place within a day or so after a gynecological operation, can it possibly be that it was due to changes in the genital organs wrought by operation? Is it not logical and more nearly in accord with experience to attribute such recovery to the psychic state induced indirectly by the operation or even by the thought of it? I have seen, in a case of simulated brain trauma, a hysterical hemiplegia disappear following general narcosis, scalp incision, and elaborate dressing. Others (32) have reported similar good results following simulated operation on the genital organs. It is particularly among the unstable psychoneurotics that such suggestive therapy is efficient. It is one of the most salient criticisms of Bossi's work that all but five of his forty some cases of what he diagnosed as *Wahnsinn* were instances of psychoneuroses and not true psychoses and that the cure was largely, if not entirely, due to the psychic state engendered in the patient by suggestion. From the psychiatric standpoint the work of Bossi is quite worthless and his conception of the psychoses is comparable to that of the layman. Bossi has also been quite severely criticised in regard to some of his gynecological conceptions. This is especially true with regard to his assertions as to the great frequency of septic endometritis and in connection with certain of his methods of treatment. In reference to the former Carstens says, "such cases must certainly be rare."

### B. PROOF OFFERED TO SUPPORT THE TOXIC AND ENDOCRINIC THEORIES

In as much as Bossi has been such an ardent supporter of the toxic theory it will not be amiss to mention briefly the means by which he claims to have arrived at the conclusion that this mechanism is a most important one in the causation of mental disorder. In the first place Bossi believes that in amenorrhœa the retained menstrual discharge acts as the toxin. This is his most direct statement of belief. Regarding the manner by which other genital disorders may result in the production of a toxic agent which in turn affects the central nervous system he is somewhat more vague. Of his attempts to demonstrate the toxicity of uterine and vaginal secretions by animal experimentation we will make but the briefest comment. It would appear from the criticism of this work that his conceptions of the technique essential to prevent contamination while obtaining such secretions, of the controls of methods of animal experimentation and of bacteriology in general, were no more developed than his knowledge of psychiatry. It will avail us little to go further in our remarks concerning the conclusions of this writer. Such comment as has been made

appeared almost necessary because of the ultra-extravagant claims which their originator has made for the results which he asserts he has obtained.

As to the observations which have been made to support the theory that mental disease does result from a disturbance in the structure and function of the sexual glands of internal secretion there is much of a speculative nature which might be said. In the first place, we know too little of definite nature of the physiological action of such internal secretions. Most of our knowledge has been derived by experimental therapeutics, by analogy from the result of animal experimentation and from the study of individuals in whom these glands have been diseased or removed. There is actually very little knowledge of fact regarding the subject, not sufficient at least to permit a claim that a disturbance of these secretions is the direct cause of a mental disease. By most observers this situation is fully recognized and we meet with more frequent expression of the opinion today that the sexual glands do not act independently, that we must consider more fully what effect a disturbance in sexual gland secretions would have on the endocrinic system in general and what the consequent effect of such a systemic disturbance on the nervous system would be. That disturbance of function in certain of the ductless glands may act as the fundamental cause in the production of psychic anomalies, there can no longer be any doubt. To such a possibility we have already referred in the case of the thyroid and pituitary and there is some evidence to show (33) that defective mental growth may possibly be dependent upon disorders in the pineal body. Facts have not demonstrated that other mental diseases are resultant from disorder in the ovaries or its internal secretion and analogy does not justify the assumption that such may be the case.

It is admitted (19) that ovarian insufficiency is a difficult condition to diagnosticate and yet we are in a position to observe the effect of such hypofunction perhaps more easily than is the case with almost any other glands. Removal of these glands has been, especially some years ago, a very common procedure. Not only was oophorectomy performed because of malignant and similar diseased conditions but even entirely normal ovaries were frequently removed as a remedy for mental disease. What the results have been from such operations we all know—so far as the mental condition is concerned; no improvement and perhaps some aggravation. Possibly, in part from our knowledge of the effect of total ablation of certain other endocrinic glands, we have come to recognize that it is unwise to remove all ovarian tissue unless disease makes this imperative. The previously mentioned study by Gordon (34) on the effect of complete oophorectomy in women led to the conclusion that, although a total removal of these glands was often followed by the appearance of a train of nervous symptoms, in no instance was a true psychosis thus occasioned. It is of passing interest to comment upon the fact that, whereas not many years ago a removal of the ovaries was recommended to cure a psychosis, today there is a strong tendency to believe that functional insufficiency on the part of these glands causes mental disorder. What was once a cure has now become a cause. This alone tends to show how little we really have known (or know?) concerning the part played by these organs.

### C. MENSTRUAL FUNCTION AND PSYCHOSES

In speaking of ovarian insufficiency or hyperactivity, mention of various menstrual disorders is not uncommon. Likewise is the very trite belief that menstrual disturbances and mental disease are closely associated in relation of cause and effect very generally expressed. The question arises at once, are the menstrual disturbances, other than those which owe their origin to known organic genital disease, dependent upon the deranged ovarian function, and if so, is a coincident mental disorder to be referred to the former or to the latter? Or may both of these be explained by the removal of the integrative action of the brain through the agency of an existant mental disease? The enormous potential to produce disturbances within the central nervous system attributed

to anomalies in menstruation appears to have been somewhat overestimated. We are not surprised to meet with statements to the effect that menstruation *per se* may produce a psychosis or aggravate the symptoms of one already present. Not only the laity, but the profession, is too prone to attribute to the menstrual process a most important rôle in relation to mental function both in states of health and disease. The experience of Taussig led him to conclude that only occasionally was a psychosis aggravated during menstruation. Amenorrhœa is only an accompanying symptom or condition with the psychosis (35) but it is at the same time believed that menstruation may in some instances have a causal relation to certain psychoses. Haymann (36) who has made recently a most careful study of the relation of menstrual disturbances to psychoses, draws some very instructive conclusions from his work. He notes that cessation of the menses is very commonly associated with the psychoses. It occurs sometimes before the psychosis develops but more often after its incidence and during its course. It therefore cannot be looked upon as the cause of the psychosis with so much reason as the result. Haymann found amenorrhœa rather rare in paranoia, seldom in imbeciles and not more often in hysteric persons, psychopaths and degenerative insanity. Cessation of menstruation occurs in 50 per cent of epileptics, in about one third of manic depressives, with about equal frequency in the excited and depressed phases. It is most common in dementia præcox, especially catatonic forms, and also, in the organic psychoses. In dementia præcox this cessation is coincident with a loss in weight, and with the return of the menses there is also a gain in weight. However, in this disease, the menstrual irregularity itself is of no more value in diagnosis or prognosis than is the change in weight alone.

### D. INDICATIONS FOR GYNECOLOGICAL OPERATIONS OR TREATMENTS AND OTHER FEATURES INCIDENT TO SUCH PROCEDURES

That mental disorders do occasionally clear up following gynecological treatment, and especially if this be operative, must be admitted. But are there not possibly other factors to consider aside from the operation on the local condition itself? The psychic effect has already been mentioned. Incident to operative aftercare several factors which are recognized to have an influence for the betterment of mental cases come into play. Principal among these should be mentioned the rest in bed, ofttimes enforced by restraint, and the special dietary measures employed. In too many institutions for the care of the insane, custodial measures are paramount while actual modern hospital treatment, as practiced in general hospitals today, comes into existence only under quasi-extraordinary occasions, in which class belong surgical operations. In other words, a patient who has been subjected to operative treatment receives that sort of general hygienic and medical care which is best calculated to benefit the mental as well as physical health. Therefore, how much credit for cure should be given to this aftercare and how much to the operation itself is an open question which deserves some consideration in the evaluation of the curative rôle of surgery and its necessitated improved medical attention during the period of operative convalescence. It must be remembered too, in this connection, that other occurrences during the course of a mental disease, more accidental in character than are operations, may sometimes bring about a clearing of the mental state. Thus we see a case of dementia præcox greatly improve or even recover incidental to the appearance of an acute tubercular or other acute infective disease. Cases of paranoia may drop their delusions and become apparently rational during the later stages of a carcinomatous involvement of the breast or abdominal viscera. It is, in fact, upon the basis of such observations that the production of sterile abscesses has been recommended as a therapeutic procedure in some mental disorders. These instances are cited simply to emphasize the point that we must not lose sight of the fact that real or apparent cures or improvements in psychoses following operation may not be due immediately to the operative results so much as to altera-

tions which we do not thoroughly understand and which are indirectly brought about in the organism as a whole. That is to say, we must be careful not to attribute the good to the operation alone because it is the most obvious explanation at hand.

Regarding the indications for gynecological operations on the insane there has existed some difference of opinion, more so in the past than now. Opinion has swung from one extreme to the other and finally come to rest, at least for the present, in the midway position of conservatism. About twenty years ago operative indications were not based upon the condition of the genital organs but rather upon the mental state. Rather rapidly opposition to such practice acquired force and it was then thought that gynecological operations should be performed on the insane only when physically urgent. The consensus of opinion today may be said to be that gynecological operations on the insane are indicated practically as they are on the sane; that no operation should be performed because of the mental state but only when the local conditions make it advisable and when the mental disease permits or does not contra-indicate. We may now well use the statement of Hobbs made nearly two decades back, although in a different sense from that which he intended it, that "surgical gynecology among the insane has already passed the experimental stage, and the practical results obtained, claim for the subject the recognition and encouragement which its importance demands." That gynecology has a place in our hospitals for the insane is manifest but that it can act as a cure-all for mental disease in general is absurd. Fortunately this latter extreme attitude is now rare among gynecologists, as it always has been among the more conservative, and operations are more generally carried out now either because the local condition makes it necessary or because it is thought that the genital disease may serve as an irritant and thus constitute one more element tending to prolong the psychosis. However, as Walthard cautions, gynecologists should take care to recognize the psychic element when present and in some cases undertake no operation or local treatment unless urgent, even though genital disease is present.

## IV. Conclusions

In the foregoing pages an attempt has been made to consider the origin of the belief in the causal relationship of genital to mental disorder, to review the theories which have been advanced in explanation of the character of such relationship, to analyze the data which have been presented in support of such theories, and finally, to determine what is the present attitude toward the matter. Such an attempt must of necessity cover an extensive territory, and therefore, it becomes obvious that not much more than an outline will be possible in the space allotted on this occasion. However, what have appeared to be the most definite points of contact between genital disorder and the psychoses proper have been given consideration commensurate with their estimated importance.

One cannot examine far into this general subject without being impressed with the wide difference of opinion which has obtained, not only between the gynecologist and the psychiatrist, but among gynecologists and psychiatrists themselves. Absolutely contradictory views have been held at different periods and even at the same time. Of course, as is equally true of many other phases in the development of medical knowledge, speculation has been rampant and conclusions have been drawn from inaccurate or inadequate observational data. Definite issues have been obfuscated by cloaking in more or less metaphysical terms. The more conservative have always stood forth to check the psychotherapeutic neurologist as well as the operating gynecologist, but not always have they been able to preserve the balance of opinion. Thus, in regard to the treatment of mental disease, we have run the gamut from advisement of complete oophorectomy in genitally normal females to non-operative treatment in females with demonstrable genital disease. No one can argue that both of these views can be correct. It is natural that in the course of time, with here and there the exception in an occasional

jet, the springs should have found their normal level in the attitude of general conservatism which today prevails.

In the more recent of the theories which have been proposed it is somewhat problematical whether we have something actually new other than in name. For instance, may not the toxic or endocrinic theories be merely terms used to express in more modern language what was formerly less definitely (scientifically!) understood by the term reflex? Have we found that any proof exists indicative that a toxic or endocrinic disorder referable to the female generative tract acts as a cause in the production of any psychosis? So far as I have been able to ascertain, with the exception of puerperal infections and the like, there is none. Some years ago the writer took occasion to point out (38) that it was largely by analogy that we came to assume that some toxin might be the cause of mental disorder. And "so it happens that whenever problems concerning the etiology of mental disorders are brought up for consideration, the discussions abound with such vague, indefinite and meaningless expressions as malnutrition, auto-intoxication, exhaustion, toxins, etc., the only inference from which often seems to be that the user endeavors to postulate some hypothetical disturbance of the metabolic functions, in the attempt to elucidate some point in etiology which, in his scheme of causation, is still obviously obscure and wanting explanation." As far as we have been able to ascertain, the facts available do not warrant the assumption that diseases of the ovary or disorders of its internal secretion are in themselves responsible for the production of mental disease.

It has been shown that the observations which have been brought forward to support the belief that genital disease may act to cause insanity in women, or that the local treatment of such disease may act to cure such psychoses, have not taken into consideration certain important phases and accessory factors and are, therefore, subject to other interpretations than those which have been placed upon them. The ratio of male to female insane and the comparative frequency of gynecologic disease in mentally normal and insane females does not bear out the contention that this etiologic factor deserves the importance credited to it by some. The statistics show that there are actually fewer female insane than male and that among the former gynecological diseaes is, if anything, less frequent than among not insane females. In the evaluation of the effect of the gynecological treatment on the cure or treatment of the mental disease, the greatest error has arisen because of the absence of adequate psychiatric estimation of the type of psychosis concerned. It is, therefore, not greatly surprising to learn that the vast majority of mental cures reported have occurred in psychoses which the psychiatrist recognizes are more or less acute and self limited. In these cases, recovery will take place, it may almost be said, in spite of treatment. Where operative indications exist, and it is now the consensus of opinion that they are the same in the insane as the sane, the results obtained by operation should not be considered apart from the possible effect of such measures as are instituted during the period of post-operative care. Rest in bed, selected diet, and generally improved hygienic surroundings are means employed to cure mental disorders and these are just the measures which are often first brought into action during the post-operative period. The operation itself is usually the smallest part of the treatment in many instances.

What has been said of gynecological disease applies almost equally well to the process of menstruation. Although the menstrual period is accompanied normally by a certain group of phenomena referable in part to alterations of function of the nervous system, although these are sometimes exaggerated in so-called "nervous women," it has not been shown that menstruation itself is the cause of a psychosis. Menstrual anomalies do occur in the insane but it would seem that they owe their occurrence more to the deranged function of the nervous system rather than that the latter depends upon the former.

We have in part accounted for the belief that female genital disease may cause insanity. The widespread belief in this etiologic moment

which has been, and is yet, held by the public at large and by the general profession is certainly an important element. This popular belief should be looked upon as a superstition which must be lived down. It is, however, a fact that there are some gynecologists of wide following who do still claim that mental disease is due to genital disorder and that treatment of the former should be by the removal of the latter. The advocates of this belief are really but few in number while the opposite stand is taken by the more conservative majority. The history of the development of medical knowledge is marked by the evolution and decay of fads and fancies such as we have had under consideration. The calm judgment of the majority, both psychiatrists and gynecologists, tends at present strongly to the belief that in female genital disease or dysfunction we do not find a cause of insanity and that gynecological treatment, even where indicated, cannot be recommended as a cure for the psychoses.

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# HERNIAS OF THE URINARY BLADDER[1]

*a.* NATURE. *b.* MODERN OPERATIVE TREATMENT. *c.* CONCLUSIONS

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THE permanent or temporary escape of a part or the whole of the urinary bladder, through any of the usual or unusual hernial orifices, is uncommon. Nevertheless, many case histories have been published and a much larger number allowed to pass without being recorded. In a long series of hernia operations, every surgeon is certain to meet with some instances of hernia of the bladder. The urinary bladder in part or in its entirety is present in 1 per cent of all hernias.

Though the term hernia implies the presence of a hernial opening, of a hernial sac, sac-contents and sac-coverings, we know that in many hernias of the urinary bladder the sac is either incomplete or totally absent. However, to designate the clinical entity under consideration, we fail to find any other term more appropriate, more sanctioned by long usage, than that of hernia of the urinary bladder.

Many operators without their knowledge have punctured, incised, ligated, or removed a herniated bladder-process and then closed the hernial canal and operative wound in the usual way. Bladder protrusions have been excised by mistake for hernial sacs, or stitches used to close hernial canals have been passed too deeply and found at the necropsy to have caught the bladder.

As vaginal bladder hernias fall more appropriately within the domain of the gynecologist, we did not include them in this contribution. All the hernias herein considered are external hernias, that is, their outermost overlying saccular covering was skin; each after reaching a certain stage of development gave rise to a more or less visible and palpable, external swelling in the obturator, femoral, inguinal, or other region, depending upon the anatomical location of the hernia.

We will discuss the subject under the following subheads:

1. Incidence as to age, as to sex, as to side involved.
2. Anatomical types.
3. Clinical types.
4. Etiology.
5. Symptomatology.
6. Clinical manifestations.
7. Operative findings.
8. Diagnosis.
9. Treatment.
10. Conclusions.

## INCIDENCE AS TO AGE

In most cases, it was not possible to ascertain the age at which the hernia first appeared. We therefore tabulated the age of the patients at the time of operative relief. In three cases, the patient's age at time of operation is not or is indefinitely stated. The other patients at time of operation were from:

| | |
|---|---|
| 16 to 25 years old | 9 cases |
| 26 to 35 years old | 27 cases |
| 36 to 45 years old | 31 cases |
| 46 to 55 years old | 36 cases |
| 56 to 65 years old | 19 cases |
| 66 to 75 years old | 15 cases |
| 76 to 80 years old | 5 cases |

Our personal clinical observation and a review of the literature justify the following conclusions as to age incidence of hernias of the urinary bladder:

a. They are extremely rare in infancy, childhood, and adolescence. During the first year of life, not one patient, and previous to the sixteenth year, only 13 patients are reported to have been operated for hernia of the urinary bladder.

b. They are most frequent after the fortieth year of life. Ninety-one patients out of 159 unselected consecutive herniated in-

[1] This article is based on an analysis of all the vesical hernias reported with sufficient data in the English, French, and German languages from 1896 to 1914, inclusive (literature to which access can be had at the John Crerar Library, Chicago, Illinois), and also of some unpublished personal cases (159 patients, representing 164 vesical hernias).

dividuals were operated on for the relief of this condition during the fifth and subsequent decades of life. Five of these patients, presented each a right and a left vesical hernia.

c. Hernia of the bladder is an infirmity occurring chiefly in advanced life.

### INCIDENCE AS TO SEX

Hernias of the urinary bladder, like all hernias of viscera common to both sexes, are found more frequently in males. The 164 hernias herein studied and analyzed were distributed as follows: Masculine pseudohermaphrodite, 1 case; females, 62 cases; males, 96 cases.

Case reports show that, in the female, these hernias occur in nulliparæ, in primiparæ, and in multiparæ. They first become manifest either before, during, or after gestation, or between successive pregnancies.

In looking over the cases, we find that vesical hernias have occurred in:

| | |
|---|---|
| I-para | 5 times |
| II-para | 3 times |
| III-para | 2 times |
| IV-para | 1 time |
| VI-para | 1 time |
| VIII-para | 2 times |
| IX-para | 1 time |
| XIV-para | 1 time |
| Multipara | 3 times |

In the other subjects, no definite statement is made as to pregnancy.

### INCIDENCE AS TO SIDE INVOLVED

Most hernias of the urinary bladder are unilateral. Out of 159 patients suffering from this infirmity, only 5 presented double vesical hernias. In 37 females and 51 males, the hernia was on the right side; in 17 females and 41 males, it was on the left side. We thus see that hernias of the urinary bladder show in both sexes a noticeable predilection for the right side.

In bilateral hernias, both hernias either appear simultaneously, or, as is more frequent, an interval of time, measured in weeks, months, or years, elapses between the appearance of the first and that of the second hernia.

### ANATOMICAL TYPES

Hernias of the urinary bladder appear at various anatomical sites. Indirect or oblique inguinal hernias escape from the abdominopelvic cavity, above Poupart's ligament, by way of the external inguinal fossa, and follow in their progress outward the course of the spermatic cord in the male, or of the round ligament in the female. They are complete or incomplete, according as the herniated viscus or viscera emerge or not beyond the external opening of the hernial canal. The complete are pudendal or scrotal. In the former, the hernial swelling descends into a labium majus, in the latter, into a scrotal pouch.

Direct inguinal hernias escape from the abdominal cavity by emerging through either the middle or the internal inguinal fossa and first appear externally at the superficial abdominal ring. Direct inguinal hernias are always to the inner or medial side of the deep epigastric vessels, and, unlike the indirect, do not follow the entire course of the inguinal canal.

In our cases, we find 27 patients with direct inguinal hernias and 87 with indirect or oblique inguinal hernias. Of the 27 patients with direct inguinal hernias, 5 were females. Direct hernias are very rare in the young. Of the 87 patients, 13 with indirect or oblique inguinal hernias were females.

In our list of cases, there were 42 femoral hernias, 40 of which occurred in female patients and 2 in males.

What precedes shows that—

a. Inguinal vesical hernias are more common in men than in women.

b. Femoral vesical hernias are far more common in women than in men.

c. Femoral hernias of the urinary bladder are an exception to the general rule, which is that inguinal hernias are more frequent in women than femoral hernias. Forty female patients presented femoral vesical hernias and only 17 presented inguinal vesical hernias.

d. Direct inguinal vesical hernias are of frequent occurrence. Out of 114 inguinal vesical hernias, 27 were of the direct variety, that is, in 27 cases the herniated bladder-process was to the inner side of the deep epigastric artery.

Gladstone's case of left obturator extra-

peritoneal bladder hernia is the only obturator vesical hernia reported in the period covered by this paper. It coexisted with a right obturator tubal hernia of the third variety and a right reducible femoral intestinal hernia.

Gerulanos' and Tedenat's cases were irreducible suprapubic hernias of the linea alba, consisting solely of a prolapsed bladder diverticulum. In these 2 cases, both of which occurred in VIII-paras, the pedicle of the hernial swelling passed above the upper surface of the symphysis pubis, and had emerged from the abdominal cavity through a round orifice between the two recti muscles.

According to the relation which the bladder protrusion bears to the peritoneum, hernias of the urinary bladder are classified into the following three varieties:

a. Intraperitoneal, in which there is a complete hernial sac.

b. Paraperitoneal, in which the herniated bladder-process is covered by peritoneum on one surface.

c. Extraperitoneal, in which the herniated portion of the bladder is neither engaged in, nor contiguous to, a hernial sac.

In the intraperitoneal variety, the herniated portion of the bladder has a complete peritoneal covering and is contained in a true hernial sac. In the paraperitoneal variety, the herniated bladder-process lies to the inner side of the sac, and its serous covering enters in part into the formation of the hernial sac. Part of the herniated bladder-process has no peritoneal covering. The paraperitoneal form is not uncommonly a sliding hernia, and is frequently due to a continuous pull and traction exerted by the sac of an existing enterocele, epiplocele or entero-epiplocele upon the peritoneal covering of the urinary bladder. In the extraperitoneal variety, the herniated bladder-process has no peritoneal covering. The prolapsed bladder is neither present in nor does it enter into the formation of a hernial sac. The extraperitoneal bladder-protrusion is in relation with the subcutaneous tissues and is always distinct from and to the inner side of the hernial sac, if one be present.

In the 164 reported cases, the hernia is definitely stated to have been—

Intraperitoneal in 4 cases (females, 1 case).

Paraperitoneal in 53 cases (females, 21 cases).

Extraperitoneal in 58 cases (females, 22 cases).

In the cases not included in the above tabulation, the relation of the herniated bladder-process to the hernial sac, when one was present, is not precisely recorded.

### CLINICAL TYPES

Any hernia of the bladder, be it intraperitoneal, paraperitoneal or extraperitoneal, may be reducible, irreducible, inflamed, obstructed, or strangulated.

If the contents of a hernial sac return spontaneously to or can be manipulated back into the abdominal cavity from which they have escaped, the hernia is said to be reducible. At first, most vesical hernias are reducible; the larger number, sooner or later, become irreducible. Reduction of hernial contents, spontaneous or manual, may be temporary, may be permanent, and is effected with more or less difficulty (general anæsthesia may be required). In our collected cases, there were 48 hernias, the contents of which could be completely reduced. Of these, 16 occurred in female subjects.

If the hernial sac-contents cannot be manipulated back into the abdominal cavity, the hernia is said to be irreducible, provided that the irreducibility *per se* does not cause any functional disturbance of the herniated organ or organs, and none or but slight interference with the blood supply thereof. The irreducibility may be recent or of long duration. Partial or complete irreducibility predisposes to inflammation, obstruction, and strangulation, and is either of sudden or of gradual onset. We noted 58 irreducible vesical hernias, 21 of which occurred in females.

If communication between the herniated and the non-herniated portion of the bladder be more or less interfered with, the urinary bladder being transformed, in some instances, into a *bissac*, the hernia is said to be obstructed.

If, in addition to irreducibility of the sac-contents, the blood supply of the herniated organ or organs is interfered with to such a

degree that their vitality is endangered or lost, the hernia is said to be strangulated. Strangulation may follow a paroxysm of coughing, heavy lifting, a fall, any strong muscular effort associated with great sudden increase of intra-abdominal pressure. There were 22 strangulated hernias, 11 of which occurred in females. In some cases, the hernia of the bladder exists alone and becomes strangulated. In some of these strangulated cases, the vesical hernia was associated with an enterocele, an epiplocele or an entero-epiplocele, the bladder was not constricted, and the herniated omentum or intestine or both were strangulated. In others, the bladder was strangulated and the herniated omentum, intestine, or both were not constricted. The bladder-wall offers more resistance to constriction than does the intestine. Strangulation of the bladder is especially grave if renal disease coexists.

### ETIOLOGY

The etiology of these hernias is largely the etiology of hernias in general. In the causation of this pathological lesion, the following factors are of importance:

A. All conditions that tend to increase intra-abdominal pressure.

1. Occupations necessitating repeated muscular efforts associated with increased intra-abdominal tension, as the lifting or pushing of heavy weights, etc. (over twenty cases in our series).

2. Physiological or pathological states which distend the abdominal cavity, stretching the abdominal parietes, and widening the orifices normally present in the muscular and aponeurotic layers of the abdominal wall (enteroptosis, obesity, abdominal tumors, ascites, pregnancy, etc.).

3. All diseases associated with frequently repeated increase of intra-abdominal pressure (long-standing lung affection, pulmonary emphysema, chronic bronchitis, habitual constipation, etc.).

B. All conditions which weaken the abdominal wall.

1. Acute or chronic diseases debilitating the organism, especially such as cause great emaciation.

2. Obesity weakens the abdominal wall and increases the intra-abdominal pressure.

3. Traumatism. Most often the traumatism does not cause the hernia, but only reveals its existence (abdominal operations). Pathologic adhesions of viscera or omentum to the anterior parietal peritoneal wall near a hernia opening may act as a predisposing cause.

4. Previous hernia operations.

5. Enteroceles, epiploceles and entero-epiploceles.

6. Feeble development or atrophy of the aponeurosis of the transversalis muscle and of the conjoined tendon. This factor is of great importance in direct inguinal hernia.

7. Unduly large hernial rings.

8. Excessive breadth of hernial canal.

9. Congenital defects present in abdominal wall.

10. Inherited or acquired weakness of abdominal wall.

11. Pre-existing hernial sacs of prenatal and post-natal formation.

C. All conditions associated with prolonged overdistention, overstretching, impaired contractility, restricted mobility, etc., of the urinary bladder.

1. Congenital malformations of the bladder.

2. Diseases of the lower urinary organs, impairing the expulsive force of the bladder or abnormally hindering the outflow of urine (vesical catarrh, prostatic hypertrophy, urethral stricture, phimosis, etc.).

3. Abnormal increase of the perivesical fatty connective tissue (lipome pré-vésical).

### SYMPTOMATOLOGY

Hernias of the urinary bladder are congenital or acquired, recent or recurrent, and of greater or shorter standing. They vary in shape, volume, rate of growth, and in amount of discomfort and disability entailed. Occasionally they occur at the site of a previous hernia operation.

Hernia of the bladder is usually an acquired condition. It occurs most commonly in late adult life and is, not infrequently, secondary to pelvic, vesical, and urethral diseases. Twenty-seven patients presented direct in-

guinal hernias. Direct inguinal hernias are said to be always acquired hernias. Forty-two patients presented femoral hernias. Except one case, that of a five-year-old female child reported by the author to be an acquired hernia, all these femoral hernias first became manifest in adult life. Congenital femoral hernias are pathological rarities. Femoral hernia is essentially a hernia of adult life. Congenital hernias appear at all periods of life. Even at the time of operation, one may be unable to differentiate between a sac of prenatal and one of post-natal formation.

Size is variable. A few of the reported hernias were simply pointed; some were hazel-nut-sized, lima-bean-sized, pigeon-egg-sized, goose-egg-sized; others had the volume of a fist, of two fists, of a fœtal head. In many, the hernial swelling is said to have been large, voluminous.

The hernial swelling may be cylindrical, ovoid, elongated-ovoid; it may be grooved or bilobed, soft, elastic, and fluctuating, or hard and non-elastic. The hernial swelling may be a large, tense, smooth tumor, may occupy the scrotum, may extend as far as the middle of the femur, may occupy the entire left labia, distorting the vaginal opening.

The size of the hernia is likely to change rapidly and considerably, being influenced by clinical type of hernia, position of body, amount of urine present in bladder, etc. The hernial swelling gives a dull or tympanitic percussion note.

Pain is an inconstant symptom. Ten of the reported cases are said to have been painless.

Diverse urinary disturbances (subjective and objective) may be present. These disturbances may be occasional or constant.

The subjective urinary disturbances are frequent urination, painful urination, pain at close of urination, difficult urination, (Patient, in order to urinate, may find it necessary to elevate or to compress the scrotum and its contents, or to both elevate and compress the scrotal contents. These patients sometimes resort to unusual positions to empty their bladder: dorsal decubitus. In a few cases, on account of the narrowing or compression of the joining isthmus, considerable difficulty is experienced in emptying the scrotal portion of the bladder into the pelvic portion.), vesical tenesmus (pressure upon hernial swelling gives desire to urinate), burning on urination.

The objective urinary disturbances are increase of swelling with accumulation of urine, decrease with voiding; two-step urination (miction *à deux temps* associated with a simultaneous lessening of the hernial swelling).

The injection of fluid into the bladder causes an increase in size of the hernial swelling. A sound introduced into bladder may enter the herniated bladder-process. A cystoscope introduced into bladder may show the round contour of the normal bladder distorted into T-shape, may show the vesical opening of the herniated bladder-process, etc.

Vesical hernias may exist alone, may be one of two or more hernias, may coexist with a hernia of other organ or organs on the same or opposite side of the body. Other congenital or acquired anomalies may be present: phimosis, ectopia testis, inguinalis, cryptorchism, vaginal cystocele, hydrocele, prolapsus uteri, hydrocele of hernial sac, etc.

### PATHOLOGY

In many cases, note is made of the excessive breadth of the hernial canal, of enlarged hernial rings. The spermatic cord may be to the outer side of the hernial swelling, may be spread out over the hernial sac, may be behind the sac, may be below and external to the sac, may be spread out over bladder (anterior and outer surfaces).

To differentiate a hernial sac of prenatal formation from one of post-natal formation is at times difficult, at times impossible.

Acquired hernial sacs, except in hernias "par glissement," are always entirely derived from the parietal peritoneum.

The sac may be thin or thick, congested and infiltrated, intimately adherent to the spermatic cord, and, not uncommonly, is capped by a thick mass of fatty tissue.

An extraperitoneal bladder hernia has no serous hernial sac. A pseudosac, consisting of connective tissue, overlies the herniated

bladder-process. This connective tissue may be much attenuated or much thickened.

There may be an unusual amount of fat in the hernial canal. In the extraperitoneal and paraperitoneal forms, the herniated bladder-process is frequently covered with fatty tissue, the "lipome herniaire" of the French authors. This prevesical accumulation of fatty tissue is thought by many to be an important contributory etiological factor.

In the paraperitoneal hernias, the serous sac is, at one point, intimately adherent to the bladder-wall. In the paraperitoneal and also in the extraperitoneal types, if a sac be present, the bladder is always to its inner, to its medial side, and, at times, below. The bladder may be adherent to the hernial sac, may be adherent to the spermatic cord.

The amount of viscus present in hernial swelling may be small, or it may be large. In some cases, the hernial swelling consists solely of the herniated bladder-process and of the increased amount of fatty tissue overlying it; in other cases, 15 in our series, of the herniated bladder-process or bladder-diverticulum and of an empty serous hernial sac. In a large number of cases, the hernial swelling includes a herniated bladder-process and a distinct or contiguous serous hernial sac with or without sac-contents. The hernial sac-contents noted in the reported cases may be hernial fluid, a part of right ureter, omentum, small intestine, large intestine, intestine and omentum, small and large intestine.

In the strangulated cases, such contents as the following were noted: Hæmorrhagic fluid and the bladder; bloody fluid, gut and ovary; a loop of congested intestine and urinary bladder; congested bluish appendix epiploica; reddish-brown fluid, bladder-diverticulum and small intestine.

The wall of the herniated bladder-process may be normal, thinned, or thickened. The herniated bladder-process may present the appearance of an empty or of a thickened hernial sac. Its cavity communicates with the cavity of the non-herniated portion of the bladder by means of a wide or narrow channel. It may be the seat of tuberculous disease, of carcinomatous disease. Calculi may be present in the herniated and in the non-herniated portion of the bladder.

The spermatic cord is sometimes found spread out over the vesical hernia, at times is distinct from it, and often is in close relation with coexisting enterocele, epiplocele or entero-epiplocele.

### DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

The existence of a hernia of the urinary bladder may be ignored, suspected or diagnosed before operation. The diagnosis may first be made at time of operation, or not before one or more days after operation. Evidence of the bladder having been wounded may not be present until some time after the patient has left the operating table. It has happened to eminent clinicians to fail to recognize even in operated cases the true state of affairs previous to the autopsy.

Before operation, the following symptoms are suggestive of vesical hernias:

1. Urinary disturbances: dysuria, two-stage urination, frequent urination, scalding urination.

2. A hernial swelling, pressure upon which causes a desire to urinate, and which increases in volume with urinary retention, and markedly diminishes in size with urination.

3. A hernial swelling, the size of which is increased by air- or water-distention of the urinary bladder.

4. A hernial swelling in which fluctuation is detected or in which a metallic sound can be introduced by way of the urethra.

5. A hernial swelling, in which, after easy reduction of most of the contents, there persists a small doughy mass representing the extruded part of the bladder.

During the course of a hernia operation, the following symptoms or signs are suggestive of vesical hernias:

1. An unusual amount of fat in the neighborhood of a hernial swelling.

2. Difficulty in finding or in isolating the true hernial sac from the tumor mass.

3. The trabeculated appearance of the bladder muscularis.

4. Large-sized external hernial opening and the fact that hernias of the bladder are usually nearer the median line than true hernial sacs.

5. The occurrence of a second hernial sac is so rare that it is a safe rule to regard as the urinary bladder, until proved otherwise, any structure resembling a second hernial sac.

6. The pedicle of a herniated bladder-process leads down behind the pubic bone into the true pelvis; the pedicle of a true hernial sac leads to the general peritoneal cavity.

Passage of sound into a cystocele, cystoscopic confirmation of its existence, escape of urine following wounding of bladder (31 cases) —all these are conclusive signs.

Keep in mind that vesical hernias are frequently associated with intestinal and omental hernias.

Injury of the bladder may not be noticed at the time of operation, and be diagnosed, for the first time, several hours after operation by:

a. Voluntary voiding or withdrawal by catheter of blood-stained urine.

b. Urine escaping from the hernial operative wound. This is usually preceded by the development and subsequent rupture or incision of a urinary phlegmon.

c. Sepsis due to urinary extravasation.

d. Peritonitis due to escape of urine into peritoneal cavity.

### TREATMENT

In discussing the treatment, we will limit ourselves to the consideration of femoral and inguinal hernias.

An operator not on his guard may incise the bladder under the belief that he is opening a hernial sac. In operating upon recurrent hernias, guard against wounding the bladder. If isolation of the hernial sac from the inner lower portion of the ring be difficult, involvement of the bladder is to be suspected. Avoid this injury by securing a good exposure of the operative field. The more exact the stripping of the sac, quite up to the deep epigastric artery, the more likely will cystocele, especially in its earlier stages, be discovered.

Vesical hernias can be produced by traction upon the sac; and efforts to place the ligature high up may, if one be careless, result in catching in its bite the bladder-wall.

The bladder was accidentally injured in 68 of the cases under consideration. In 31, urine escaped into the operative field at time of operation.

Should the bladder be incised or otherwise injured, carefully suture it and provide appropriate drainage. Immediate closure of the bladder wound is of primary importance. It is effected by two, in some cases by three, layers of interrupted or continuous sutures. Introduce your bladder-sutures so as to include all the layers of the bladder-wall, the mucosa excepted. Needless to say that only absorbable suture-material is to be employed. Even if the bladder be not opened, but merely injured, it is safer to fortify the weak spot by the introduction of a few catgut sutures.

The herniated urinary bladder-process may be (a) injured in attempts to carefully and cautiously separate surrounding adhesions (not only must one be careful as to sac-contents, but also as to contiguous tissues); (b) torn accidentally in trying to separate it from the hernial sac (the herniated bladder-process is more liable to be injured if it be the seat of such changes as are incident to strangulation); (c) punctured or pricked in suturing walls of hernial canal, in closing hernial orifice; (d) incised or ligated and cut off, being mistaken for a hernial sac.

Resection of the herniated bladder-process is indicated only if it be very much attenuated, necrotic, or the seat of other serious degenerative changes. Resection is to be followed by suture of the bladder-wound. If a calculus or calculi be present in the bladder protrusion, incise the bladder-wall, remove the foreign body, and repair vesical wound secundum artem. As a routine procedure, resection of the bladder protrusion is not to be recommended. It was performed only in 12 of the reported cases.

If the bladder protrusion be apparently normal, free it from surrounding adhesions, if any be present, and then reduce it into the abdominopelvic cavity. As a routine procedure, bladder repair, bladder resection, and bladder reduction are always to be supplemented by resection of the abdominal wall. After isolation of the herniated bladder-process, supplemented by the repair of any

injury which it may have sustained during the course of the operative procedure, we advise that the bladder be reduced into the abdominal cavity.

Vesical hernias have been successfully operated on for radical cure without anæsthesia, under local, cocaine, infiltration, spinal, and general surgical anæsthesia (nitrous oxide gas and oxygen, chloroform and ether in the majority of cases).

For inguinal hernias, the Bassini operation with or without transplantation of the cord seems to be the operation most universally employed—41 times. Czerny's, Andrews', Ferguson's, Halsted's and Kocher's type of operation were each employed once. Numerous other methods were employed.

Various types of operations were used in femoral hernias (Berger, Coley, Lotheisen's operations, etc.). Some operators closed the hernial sac by a ligature, others by a purse-string suture, others by suturing the edges. In 18 cases, it is stated that the hernial canal was freed of fatty tissue.

In all the cases in which the herniated bladder-process was not injured, in practically all those cases in which it was injured and repaired or resected and sutured, the organ, after being freed from surrounding adhesions, was returned into the abdominal cavity. Bernhard, in one case, after suturing the bladder, fixed it to the lower angle of the abdominal wound.

Operators are not agreed as to the advisability of using a permanent catheter after bladder suture, nor as to the time during which this permanent catheter, if used, should be left in the bladder. Some leave it in one day; some, two days; some, three days; some, four days; some, five days; some, six days; some, one week; some, two weeks.

Drainage extending to the bladder wound is a prudent provision against leakage from the sutured bladder. Many operators prefer, after bladder suture, to leave the abdominal wound open at its lower angle, and to close it as soon as conditions warrant.

If the hernial swelling contains in addition to a bladder-process, a knuckle of gut, a piece of omentum or some other viscus, the indication is first to free and reduce the bladder-process, and then carefully isolate, incise, and inspect the hernial sac contents. In the absence of contra-indications, all hernial sac-contents, sac-fluid excepted, are to be returned into the cavity from which they have escaped.

A deviation from this rule is indicated in cases—

1. In which herniated omentum has undergone such inflammatory, cystic or other changes, that, if returned into the abdominal cavity, it might act as a foreign body.

2. In which the herniated gut or omentum is gangrenous or of doubtful viability.

3. In which the hernial contents are in such a pathological state that their return to the abdominal cavity would jeopardize the patient's life.

The treatment of the sac-contents does not differ from that which obtains in hernial swellings in which no bladder-process is present; if those contents are injured by the surgeon, the injury calls for repair.

### RESULTS

Operations for the radical cure of vesical hernias have practically no mortality. What mortality occurs is due to concomitant circumstances: extreme old age, great debility, shock, long-standing strangulation, and unrecognized bladder injuries.

One of these hernias was a dissecting-room discovery; this leaves 163 hernias occurring in 158 subjects. There were twelve deaths; all the other patients recovered.

Operations for the radical cure of vesical hernias are rarely followed by disagreeable sequelæ. In 13 cases, a urinary fistula complicated convalescence. These urinary fistulæ usually closed spontaneously. One can, if he so desires, close these fistulæ under cocaine anæsthesia.

A careful study of the cases in which death occurred shows that operations for the radical cure of vesical hernias have no mortality *per se*, if all bladder injuries be suitably repaired. In bladder hernias, recognized either previous to or at time of operation, before closure of the abdominal wound, recovery, of necessity, is rapid and uneventful.

CONCLUSIONS

1. The urinary bladder, in part or in its entirety, may escape from the abdominal and abdominopelvic cavities through any of the uncommon or common hernial orifices of the lower abdominal wall.

2. Hernias of the urinary bladder occur in both sexes, at all ages, and in all races. They are congenital or acquired, recurrent, recent or of some standing; almost always unilateral, very rarely bilateral. Like other hernias, they vary in shape, size, rate of growth, and in the discomfort and disability which they entail.

3. In the female, vesical hernias occur in nulliparæ, primiparæ and multiparæ; they occur previous to, during, or after gestation and between gestations. They neither interfere with gestation nor disturb parturition.

4. According to the anatomical site, vesical hernias are designated as hernias of the linea alba, of the obturator, femoral, or inguinal regions. Anatomical relations justify the further subdividing of the latter into interstitial or intraparietal, direct or indirect, complete or incomplete, pudendal or scrotal.

5. The relation of the herniated bladder-process to the serous membrane lining the peritoneal cavity is well expressed by the terms intraperitoneal, paraperitoneal, and extraperitoneal. These designations are serviceable from the viewpoint of etiology, symptomatology, and treatment.

6. According to clinical manifestations, hernias of the urinary bladder are reducible, irreducible, inflamed or strangulated.

7. A vesical hernia may be single, double, or one of two or more hernias located on the same or opposite side of the body, having dissimilar contents, and presenting like or unlike anatomical and clinical characteristics. Thus, the same patient may present an inguinal cystocele and a femoral epiplocele, a reducible femoral vesical hernia, and an irreducible inguinal intestinal hernia. Case reports of an inguinal vesical hernia on one side coexisting with an inguinal enterocele, epiplocele or entero-epiplocele on the opposite side of the body are not uncommon.

8. As etiological factors in the causation of vesical hernias, the following are foremost:

1. All conditions that tend to increase intra-abdominal pressure.

2. All conditions, congenital or acquired, that weaken the abdominal wall.

3. All diseases of the lower urinary organs that impair the expulsive force of the bladder or abnormally hinder the outflow of urine.

4. Pre-existing hernias and hernial sacs of prenatal or post-natal origin.

9. The pre-operative signs and symptoms may be unmistakable, vague, or absolutely wanting. In addition to such symptoms as are common to all other hernias, vesical hernias present peculiar suggestive and positive manifestations of their existence. Chief among the former are such disturbances of micturition as the following: frequent, painful and difficult urination, vesical tenesmus, urgent desire to urinate caused by pressure upon hernial swelling and two-step urination. Chief among the positive manifestations are: a hernial swelling increasing in size with urinary retention and decreasing with urination; increase in size of a hernial swelling with air or water-distention of the bladder and decrease upon withdrawal of these agents; passage of a sound into the herniated bladder-process by way of urethra and bladder; cystoscopic demonstration of the vesical orifice of the herniated bladder-process.

10. The herniated bladder-process may be the sole content of the hernial swelling, or merely one of the associated contents. In addition to a bladder-process, a hernial swelling may contain a part of one or more of the following organs: ureter, fallopian tube, ovary, appendix vermiformis or appendix epiploicæ, omentum, and small or large intestine.

11. The herniated bladder-process may be free or adherent to surrounding tissues or organs, structurally normal or present degenerative, inflammatory or neoplastic changes; may be the seat of atrophy, hypertrophy, catarrh, gangrene, tuberculosis, or carcinoma, and may or may not communicate freely with the general vesical cavity. The herniated process of bladder may contain one or more calculi.

12. The vesical hernia may be the sole existing anomaly, or it may be one of two or

more congenital or acquired pathological states, having or not having any relationship of cause or effect to the hernia (cryptorchism, vaginal cystocele, prolapsus uteri, prostatic hypertrophy, etc.).

13. Truss treatment for hernias of the bladder is not curative, is often productive of discomfort and may injuriously affect the structure of the bladder-wall.

14. In patients over ten years of age, all hernias, irrespective of anatomical site, clinical condition or contents, should, in the absence of a constitutional state contra-indicating operations of election, be subjected to an operation for radical cure.

15. Clinical conditions so closely simulating hernias of the urinary bladder that a positive diagnosis without operation appears impossible, should be subjected to operative treatment. Only benefit can be derived from adherence to this rule. A diagnosis is established and a cure is effected.

16. All hernias of the urinary bladder, irrespective of sex, age or social condition of patient, irrespective of size, shape, anatomical site or clinical type, call for operative treatment. Operative treatment is free from danger and is curative. The only contra-indications to operative treatment are extreme old age and the co-existence of a pathological state or states contra-indicating operations of election. Operative treatment is the only rational treatment of hernia in the adult.

17. In all incarcerated and in all strangulated hernias of the bladder, operative intervention is indicated.

18. In all hernias, the ideal time for operation is previous to the development of degenerative or other pathological changes in the herniated organ or organs and previous to the occurrence of any of the various complications incident to hernias.

19. Women who suffer from any form of hernia should be carefully watched before, during, and after their confinement, so as to prevent or rather minimize any undue strain upon weak regions of the abdominal wall. These women, at the close of lactation or toward the end of the first year following their confinement, should, in the absence of contra-indications, be subjected to an operation for radical cure of the hernia. In the female, the inguinal rings are comparatively small. They can be closed without inconvenience to the patient.

20. The most popular and efficient modern hernia operations permit a full view of the operative field and allow such a careful examination of hernial rings, canals, and surrounding structures that a prolapsed or herniated viscus rarely escapes detection.

21. In inguinal and femoral hernia operations, after the careful opening and isolation of the sac, see that the latter consists preferably of peritoneum only, and that its neck be freed from all other structures. The neck of sac should not be twisted, as by so doing the bladder is drawn toward the hernial opening and is liable to be included in the ligature. Necrosis and peritonitis result therefrom.

22. In the course of a hernia operation, if, after opening of the sac and reduction of its contents, there appears a second sac, it is not to be opened, unless the introduction of a sound in the bladder shows the complete independence of this sac from the urinary reservoir.

23. In hernias of the urinary bladder, first expose and free the herniated organ or organs, and then reduce it into the abdominopelvic cavity. Follow this by suppressing the hernial sac if one be present, and then, according to an approved method, strengthen the weakened hernial area. Resection of the herniated bladder-process is only exceptionally indicated. When performed, it calls for immediate reconstitution of the urinary reservoir.

24. During hernia operations, the wounding of the urinary bladder can, to a large extent, be prevented by careful operating and by keeping this clinical entity in mind.

25. Wounds of the urinary bladder inflicted during the course of hernia operations, give a good prognosis if they be immediately, accurately repaired and if appropriate post-operative treatment be instituted. In the repair of bladder-wounds, two or three layers of continuous or interrupted absorbable sutures give satisfactory results. Bladder

suturing is to be followed by refection of the abdominal wall of the hernial area.

26. If within twenty-four to forty-eight hours after a hernia operation on a healthy subject, the catheterized urine contains blood, determine the origin of that blood. If a bladder-injury be present, open the hernial operative wound or laparotomize, or do both and repair the injury.

27. The mortality of operations for the radical cure of hernia, if performed at an opportune time by a rapid and skillful operator competently assisted, is practically nil. Coley operated upon 1,000 consecutive cases of hernia without a single death.

28. The operative treatment of hernias of the urinary bladder is highly satisfactory.

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# CONCERNING THE VALUE OF SODIUM CITRATE SOLUTION IN THE PREVENTION OF PERITONEAL ADHESIONS[1]

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SAXTON POPE (1) was the first to suggest the use of sodium citrate solution as a means of preventing the formation of adhesions following operations in the peritoneal cavity, and based its use on the fact that sodium citrate prevents the formation of fibrin from fibrinogen. After experimenting with citrate solutions of various percentages, he found that a 2 per cent solution in 3 per cent sodium chloride solution was the most suitable concentration. His results with this solution in his experimental work on rabbits were striking; and as there were no apparent ill effects in the clinical cases he referred to, the method seemed to warrant further experimental and clinical trial.

At the suggestion of L. L. McArthur I had a quantity of the solution prepared, put into flasks each containing 500 ccm., sterilized on three successive days, and then kept at the proper temperature for immediate *clinical* use. I used the solution in one human case only. Although this was done very soon after I had started my *experimental* work on dogs, I shall first discuss my dog experiments, and come back to this clinical case later.

As Pope's experiments seemed to indicate that sodium citrate solution prevents the *primary* formation of adhesions, I was interested to determine whether the solution would prevent the *reformation* of already existing adhesions after these had been separated or divided. It was with this object in view that this research was begun.

In order to determine this point, the experiments which are detailed below were carried out. Dogs were used for the experiments because I believe their peritoneum probably more closely resembles the human peritoneum than does that of the rabbits. All operations were done with the dogs under ether anæsthesia the usual aseptic precautions being observed.

At a primary operation a median laparotomy was performed, and the surface of the gall-bladder and the pyloric end of the stomach were painted with pure tincture of iodine to cause the formation of adhesions. The abdomen was then closed in layers, using a continuous plain catgut suture for the peritoneum, a running chromic catgut suture for the fascia, and a continuous black waxed silk suture for the skin.

That painting peritoneal surfaces with tincture of iodine will cause the formation of firm adhesions is well known (Borst, 2, Heinz, 3). Kausch (4) used this method to produce adhesions between the upper surface of the liver and the diaphragm, between the anterior surface of the liver and the anterior abdominal wall, and between the omentum and the abdominal wall, with success in a case of atrophic cirrhosis with ascites, instead of doing the

[1] Presented in abstract before The Chicago Surgical Society, November 5, 1915. (See p. 631.)

Talma operation which he never found entirely satisfactory, and which is more dangerous because of the hæmorrhage which not infrequently occurs.

Some time after performing this primary operation to produce adhesions, a second laparotomy was done; the adhesions which had formed were separated, oozing was controlled as well as possible, and then the peritoneum was closed as before. Just before ending the peritoneal closure, however, i.e., just before drawing the last stitches together, the neck of a glass funnel was inserted between the last stitches, which were separated, and were then drawn taut so that the peritoneum was pouched closely about the neck of the funnel. As much sodium citrate solution was now poured into the abdomen as the latter would hold, and then the peritoneal suture was drawn tight while the funnel was being withdrawn, so that none of the citrate solution could escape. Finally, the suture was knotted, closing the peritoneal cavity tightly. The fascia and skin were then closed as described above.

At a third operation, or at autopsy, the abdominal cavity was again opened to note whether the adhesions had reformed and, if so, whether they were less extensive than before.

Dog 1. Operated upon October 19, 1914. The gall-bladder and pyloric end of stomach were swabbed with iodine to cause adhesions. Second operation, November 10, 1914. There were adhesions between left lobe of liver and omentum, and left lobe of liver and stomach. A few adhesions between the gall-bladder and the omentum. All these adhesions were separated and about 100 ccm. of sodium citrate solution introduced. The dog was killed December 1, 1914. Autopsy showed that more adhesions were present than originally. They were very numerous and firm between the gall-bladder and the stomach, and between the gall-bladder and the liver, also between the liver and the abdominal wall.

The sodium citrate obviously did not prevent the reformation of the adhesions but even seemed to favor their formation.

Dog 2. Primary operation October 22, 1914. The gall-bladder and the pyloric end of the stomach were swabbed with tincture of iodine to form adhesions. The abdomen was reopened October 27, 1914. There were no adhesions between the gall-bladder and the stomach, though there were some holding the omentum to the anterior wall of the stomach near the pylorus and to the scar in the abdominal wall. In a second attempt to produce adhesions between the gall-bladder and the pylorus, these were again swabbed with iodine and a single stitch of plain catgut inserted to hold them in contact. November 17, 1914, the abdomen was reopened. There were no adhesions between the gall-bladder and the stomach, though there were some uniting the omentum to the gall-bladder, stomach, and liver. These were separated and then sodium citrate solution was introduced. The dog died January 28, 1915. There were some adhesions between the stomach and the liver but none between the gall-bladder and the stomach. The omentum was adherent to the anterior abdominal wall in the operative scar.

Here again the citrate solution failed to prevent the reformation of adhesions.

Dog 3. At a primary operation on November 3, 1914, the gall-bladder and pylorus were swabbed with tincture of iodine. Reoperation on November 19, 1914, showed a few adhesions of the omentum to the gall-bladder and to the stomach but many to the anterior abdominal wall. The same regions were again painted with iodine and then, just before closing the abdomen, about three ounces of sodium citrate were introduced. Reoperation sometime in December (date not recorded) showed very firm dense adhesions between the anterior surface of the liver and the anterior abdominal wall, and between the omentum and the liver; and dense adhesions between the pylorus and the inferior surface of the liver. These were carefully separated and the abdomen filled with sodium citrate solution. The dog died January 23, 1915. At autopsy the cause of death could not be determined—no peritonitis. There were many firm adhesions between the anterior surface of the liver and the anterior abdominal wall; between the pyloric end of the stomach and the inferior surface of the liver; between the inferior surface of the liver and the duodenum; between the gall-bladder and the duodenum; between the omentum and the pyloric end of the stomach and the duodenum.

Here, as in the previous cases, there were more adhesions now than before.

Dog 4. Primary operation November 10, 1914. Tincture of iodine was applied to the gall-bladder and pylorus, and a catgut stitch put in to unite them. At a second operation November 24, 1914, adhesions were found between omentum and liver and omentum and gall-bladder. The anterior surface of the liver was adherent to the anterior abdominal wall. All these adhesions were separated and sodium citrate solution introduced. The dog was killed December 5, 1914. There were dense adhesions present, and these were much more numerous than at the previous operation, between the anterior surface of the liver and the abdominal wall; between

the liver and the pylorus, and between the gall-bladder and the pylorus. In addition, the omentum was adherent to the anterior wall of the stomach, to the gall-bladder, and between the lobes of the liver. Indeed, the viscera in the entire right upper quadrant were plastered together.

This only substantiated the former experiments.

Dog 5. Primary operation November 12, 1914, to form adhesions. Second operation December 17, 1914, when sodium citrate was introduced after separation of the adhesions. The dog died December 24, from infection.

Dog 6. Here again the dog died, this time the cause of death was not evident. Death occurred during the night after the sodium citrate had been introduced.

As the first four dogs all showed the same findings, i.e., that there were more adhesions after the original adhesions had been separated and the sodium citrate introduced, it seemed clear that sodium citrate would not prevent the reformation of adhesions in dogs under these conditions. The fact that more adhesions were observed after the original adhesions had been separated and the citrate solution introduced may possibly be attributed to the inhibition of coagulation consequent to the physiological action of the citrate solution. In other words, the oozing, which regularly follows the separation of adhesions, probably continued to an abnormal degree.

It next seemed interesting to determine whether primary adhesion formation could be prevented in dogs, as Saxton Pope reported in rabbits, using a similar technique.

Accordingly, the following experiments were carried out. At a primary operation the entire peritoneal surface of the large bowel (which is very short in dogs) was scraped with a scalpel till raw and covered with a bloody serum. Then the abdomen was filled with sodium citrate solution and closed as in the previous experiments. After some time had elapsed, or when the dogs had died, the abdomen was reopened and examined to see whether any adhesions had formed. Another set of dogs was used as controls. These were treated in exactly the same way, except that no citrate solution was introduced. The results in the citrate dogs were as follows:

CITRATE DOGS

Dog 7. Operated on December 24, 1914. In this dog both the large intestine and an adjacent loop of small intestine were scraped as described above and citrate solution introduced. The dog was killed February 2, 1915. The wound had healed nicely. There was firm fibrous union between the colon and the adjacent loop of small intestine in an area about two centimeters long and 2 millimeters wide. Otherwise the entire large intestine was free from adhesions. However, scars from the previous scraping were seen in a few areas. In other respects the large bowel appeared entirely normal. There were some adhesions between the omentum and the small intestine.

It seemed remarkable that more adhesions had not formed considering the extent and degree of the trauma. The next case was even more striking.

Dog 8. Operated on January 8, 1915. The entire large intestine was scraped as in the previous experiment and citrate solution introduced. The dog was killed February 2, 1915. There were absolutely no adhesions. The large intestine looked quite normal.

The sodium citrate solution apparently seemed to be of considerable value, but a control dog operated on the same day in exactly the same manner, except that no citrate was introduced, showed practically as complete absence of adhesion formation. This will be referred to later.

Dog 9. Operated on January 25, 1915. The colon was scraped until raw, then abdomen was filled with citrate solution and closed. On February 2, the dog was killed as the wound was open externally, and it was desirable to see whether any adhesions had formed before the wound might open entirely and peritonitis develop. Two very small and slight adhesions were present between the free surface of the colon and its mesentery — practically no change whatsoever.

Dog 10. Primary operation January 16, 1915. The colon was scraped, and citrate introduced. The dog died January 28. There were no adhesions. No peritonitis.

Dog 11. At primary operation January 19, 1915, both the large intestine and an adjacent loop of small intestine were scraped and then citrate solution introduced. The dog died February 18. The cause of death could not be determined. There were no adhesions and no peritonitis.

Dog 12. January 25, 1915, the colon was scraped until raw and citrate solution was introduced. As the wound was opening externally, the dog was killed February 2, 1915. There were very slight adhesions in two places between the free surface of the colon

and the mesentery of the colon. No other adhesions.

Dog 13. January 26, 1915, the colon was scraped until raw and citrate solution then introduced. The dog was killed February 23. There was one adhesion between two portions of the colon which was bent on itself; also an adhesion between the colon and an adjacent loop of small intestine.

In this dog again the citrate did not prevent adhesions.

Dog 14. January 26, 1915, the colon was scraped until raw and sodium citrate introduced. The dog was killed February 23. There was some thickening and scar-like discoloration on the free surface of the colon but no adhesions. The abdominal wound was well healed.

Dog 15. May 11, 1915, the colon was scraped until raw and then sodium citrate was introduced. The dog had no appetite following the operation, seemed sick, and died May 15. Post-mortem showed no adhesions, though the small intestine exhibited some redness (peritonitis?); however, the serosa was shiny and there was no fibrinous exudate. The lungs showed marked congestion of all lobes.

Dog 16. Primary operation May 17, 1915. The dog was killed May 25. There were dense adhesions between the colon and an adjacent loop of small intestine. Also the omentum was adherent to the colon. The skin incision was not entirely healed, but there was no peritonitis.

Here again the citrate solution failed to prevent the formation of adhesions.

Dog 17. Primary operation May 17, 1915. The dog was killed May 25, as the wound in the abdominal wall was not entirely healed and in one place had opened almost down to the peritoneum. There was localized peritonitis with adhesions of the small intestine through the colon and to the anterior abdominal wall. These adhesions were perhaps secondary to failure of the abdominal incision to heal resulting in peritonitis from infection from without. This could not be determined with certainty, however.

Dog 18. Operated on May 18, 1915. Killed May 25, 1915. The skin incision was not well healed, but the peritoneum was well closed and no peritonitis had developed. The omentum was adherent to the colon for almost its entire length.

Here again the citrate failed to prevent adhesions from developing.

Dog 19. Died of pneumonia two days after the operation and therefore was of no value.

As controls the following dogs were used. They were treated in the same manner as the citrate dogs except that no sodium citrate solution was introduced.

CONTROL DOGS

Dog 20. Operated on January 7, 1915. The dog died January 17 from peritonitis due to partial opening of the wound. There were no adhesions.

Dog 21. Operated on January 8, 1915. The dog died January 17, from peritonitis, the wound having opened partially. While there were some adhesions between the colon and the great omentum there were none between the large intestine and the small intestine.

Dog 22. Operated on January 19, 1915. Died February 23. The cause of death could not be determined. There were slight adhesions between the colon and two separate loops of small intestine.

Dog 23. Operated on January 19, 1915. Died February 18, 1915. There was not the slightest trace of any adhesion formation.

Dog 24. Operated on February 23, 1915. Killed March 5. One loop of small intestine adherent to the large bowel. Also some adhesions of the omentum to the large bowel.

Dog 25. Operated on March 5, 1915. Killed March 5. There were very few adhesions between the omentum and colon; none between the small intestine and colon.

Dog 26. Operated on April 13, 1915. Killed May 4, 1915. There were some adhesions between the omentum and colon. One very slight adhesion between colon and one loop of small intestine.

Dog 27. Operated on April 13. Killed May 4, 1915. There was one marked and extensive adhesion between the colon and a loop of small intestine. The omentum was adherent to the colon in several places.

Dog 28. Operated on April 19. Killed May 4, 1915. There were marked and very dense adhesions between the omentum and the colon, and between the colon and one loop of small intestine.

Dog 29. Operated on April 20. Killed May 4, 1915. There were extensive adhesions between the colon and two loops of small intestine; moreover, the colon was adherent to the bladder and the omentum to the colon. The incision was perfectly healed and there was no peritonitis.

Dog 30. Operated on May 3. Killed May 11, 1915. There was adhesion between the omentum and the colon in a small area; also one firm adhesion between the colon and one loop of small intestine.

Dog 31. Operated on May 4. Killed May 18, 1915. The omentum was adherent to the colon almost the entire length of the latter. One small but firm adhesion was present between the appendix and a loop of small intestine.

Comparison of the results in the citrate dogs with those in the controls showed that, in both sets, some animals exhibited adhesions whereas others showed none. Indeed, on opening the dogs the second time, one could not tell the citrate dogs from the controls, as there was no marked difference, though, on

the whole, the control dogs showed somewhat more adhesions than did the citrate dogs. One gained the impression that the citrate was of relatively little value, if any at all, in preventing the formation of adhesions.

That a single, severe, mechanical trauma to the peritoneum, even though extensive, is an uncertain means of provoking the formation of adhesions was observed years ago, as may be learned from the experiments reported by Kelterborn (5), Dembowsky (6), Vogel (7), Duschinsky (8), etc. This is now so generally recognized that the more recent workers have come to use other aseptic means of producing adhesions, chiefly chemical, as tincture of iodine (Borst, 2, Heinz, 3), Lugol's solution (Heinz), pulverized metalic magnesium (Payr-Schmiedt, 9 and 10), etc., Schmiedt (10), in a very recent study, used all three of these methods and these only.

Sweet, Chaney, and Wilson (11) in an article on "The Prevention of Post-operative Adhesions in the Peritoneal Cavity," among other substances studied the effect of sodium citrate solution in a series of seven dogs. Instead of using the solution recommended by Pope (2 per cent sodium citrate solution in 3 per cent sodium chloride solution) they employed a 3 per cent sodium citrate solution in normal salt solution. In each of the seven dogs, end-to-end entero-enterostomies were performed at two points, and then, just before closing the abdomen, 50 ccm. of sodium citrate solution was introduced. One dog died from peritonitis four days after the operation. In another dog the abdominal incision split open on the third day after the operation and the dog had to be killed. In the other five dogs "general adhesions" were present of the omentum to the gut in the neighborhood of the operative areas, and between the original loops of intestine to a considerable extent. "In no instance was there perfect healing of the abdominal wound, a distinct contrast with the former cases" (in which they used other substances to prevent adhesion formation). They state farther: "Our results with the use of citrate solution in dogs are just opposite from the results which Pope obtained with the same solution in rabbits." (As pointed out above, however, the solution was not exactly the same.) They believe the disagreement between their results and those of Pope "may be due to the fact that he did his work on rabbits, the peritoneum of which is generally known to be very resistant to infection, and that he was working under the artificial condition of the exclusion of possible infection." They believe, further, that the citrate solution "limits the normal production of plastic lymph so that seepage takes place through the lines of intestinal suture and a minor degree of infection follows which results later in the production of adhesions, though there is not enough infection present in all cases to give a definite peritonitis." They end by stating that "while we are not inclined to draw final conclusions, we would say that citrate solution is not indicated in cases where infection may be present."

To make further observations on this point, I operated on a series of dogs as follows: An intestinal resection was done, and after closing each of the ends by the Doyen method, a side-to-side entero-enterostomy was performed, and the abdomen was filled with 2 per cent sodium citrate solution in 3 per cent sodium chloride.

Dog 32. Operation performed March 8, 1915. The dog died on the second day from distemper pneumonia. There was no leakage and no peritonitis.

Dog 33. Operation performed March 9, 1915. The dog died March 17 from distemper pneumonia. At autopsy, the anastomosis was found to be water tight; there had been no leakage and no peritonitis. However, there were some adhesions of the omentum to the gut at several points about the site of the anastomosis.

Dog 34. Operated on March 22, died March 28, of peritonitis due to the fact that the wound in the abdominal wall had broken open.

Dog 35. Operation performed March 26. The dog was killed April 10. The anastomosis was perfect. The abdominal wound was well healed. There were some adhesions of the omentum to the site of anastomosis but no adhesions between the intestines.

Dog 36. Operation performed March 30. The dog was killed April 21. The anastomosis was perfect. There was no leakage and no peritonitis. There was a very slight adhesion of the omentum at one point to the site of the anastomosis.

Although my results were better than those of Sweet, Chaney, and Wilson, referred

to above, in that I did not have any leakage in any of my cases, and in no case had any adhesions between adjacent loops of small intestine, nevertheless, with the exception of the case that died on the second day from distemper-pneumonia, there were adhesions between the omentum and the intestine, at the site of the anastomosis, in every case.

Pope specifically states that "it is not assumed that citrate solutions will prevent adhesions where large denuded areas of the peritoneum are exposed . . . . that these laboratory results seem applicable only as a mild preventive during abdominal operations, which ordinarily tend to leave more or less agglutination and troublesome post-operative adhesions," and he does "not suggest that large quantities of the solutions be left in the abdominal cavity," but "that the usual operating room solutions of normal salt have added to them a 1 or 2 per cent of citrate of soda."

To determine whether a substance prevents adhesion formation, however, is difficult unless one has controls, and in clinical work of course we have no controls. In my dog experiments it was surprising what extensive scarification could be accomplished without any adhesions forming, and how few and slight the adhesions were where an extensive area was denuded. It was for this reason that such extensive traumatism seemed necessary in this work.

In regard to the amount of sodium citrate solution used, it should be stated that Pope in his experiments introduced one-half ounce into the peritoneal cavity of rabbits, whereas in these experiments on dogs, as has been stated, as much was introduced as the abdominal cavity would hold. And it is difficult to understand how much could be expected from the use of a very small quantity of the solution, as a small quantity would probably be absorbed before it could exert much effect. Even when larger amounts are used, it is a question whether absorption does not occur before much effect could be expected. Graser (12), in a careful study on the development of peritoneal adhesions, found that the damaged serosa epithelium required 4 to 6 days to regenerate. Theoretically, therefore, any substance which is introduced into the abdominal cavity to prevent the formation of adhesions, to be thoroughly efficacious, ought to remain at least 4 days. Schmiedt's experiments with hirudin would seem to substantiate this. He found that he had success only in animals in which he injected hirudin into the abdominal cavity daily on 4 or 5 successive days. Pope, in his rabbit experiments, found that the citrate solution he introduced remained in the peritoneal cavity only 48 hours, however.

If a practical technique could be devised whereby one could inject the citrate solution repeatedly, and if enough were injected on successive days to keep the peritoneal surfaces constantly bathed with the solution for 4 to 6 days, possibly then the results might be more uniform.

Before closing, I wish to report the *human* case in which I used the sodium citrate solution. Just ten days after I had begun this research, I had a clinical case in which the conditions seemed to justify the use of sodium citrate solution, even though so little work with it had been published up to that time. This case is interesting not only because sodium citrate was used to prevent the reformation of adhesions, but also because this was the patient's third operation for acute intestinal obstruction from adhesions, and the patient's fourth laparotomy. The primary operation was for acute gangrenous appendicitis with general peritonitis, and this produced the adhesions caused the subsequent attacks of strangulation ileus.

The patient, M. M., a boy, 14 years of age, Michael Reese Hospital, Numbers 56,835, 62,952, and 73,235, first entered the hospital during an attack of acute appendicitis, with general peritonitis. August 24, 1912, operation by Dr. D. N. Eisendrath; appendectomy through a right pararectal incision. On opening the peritoneum a very fetid, yellowish-green pus escaped from all directions. The cæcum showed marked evidences of beginning peritonitis, and all visible coils of small intestine were markedly injected and showed roughened serosa. The appendix was retrocæcal, its tip was firmly bound down and gangrenous, as was also the adjacent portion of the outer half of the cæcum. After the appendix was removed, in order to prevent hæmorrhage from its bed, a strip of plain gauze packing was inserted, the end of which was brought out through a separate stab wound at the outer side of the original

incision. The pelvis was drained by means of a tube inserted through a small suprapubic incision. The patient made an uneventful recovery and was discharged September 11, 1912.

He remained perfectly well until July 13, 1913, when he developed the typical symptoms of acute intestinal obstruction, and entered the hospital on Dr. Emanuel Friend's service. Immediate laparotomy was performed through a right rectus incision. Exploration of the abdomen showed, at the site of the old scar, adhesions of the cæcum to the abdominal wall. The point of obstruction was found near the lower ileum, where a single adhesion completely constricted the intestine, the portion below being collapsed and that above dilated. After dividing and ligating this band, two rows of Lembert sutures were inserted in the gut to cover over the denuded area of the gut which the band had produced. The intestines were so distended that it was necessary to insert a trocar to relieve the distention. The hole in the bowel thus formed was closed by a purse string suture, re-enforced by a few Lembert sutures. The recovery was uneventful, except for a small slough which developed in the middle of the wound. This cleared up rapidly, however, and the boy was discharged August 3.

He remained in good health until October 15, 1914, when he was again taken ill with acute intestinal obstruction, and entered the hospital on Dr. L. L. McArthur's service. Immediate laparotomy was performed by Dr. McArthur through a curved incision made slightly medially to the old pararectal scar. On opening the peritoneum no bowel was found adherent to the abdominal wall. On careful exploration, a loop of small bowel, 10 to 12 inches long, was found strangulated by an adhesion located about 16 inches from the ileocæcal valve. The gut was dark red in color and two thrombi were present in the arteries of its mesentery. The adhesion was doubly clamped, divided, and ligated. In a short time the color returned in the strangulated loop. No bleeding points were seen. The abdomen was closed in layers.

The patient was up in a wheel chair October 25, 1914, and was discharged October 29, 1914. Just as he was about to leave the hospital, however, he suddenly developed typical symptoms of acute ileus. Dr. McArthur kindly turned him over to me for operation, and suggested that this might be a good case in which to try the sodium citrate solution. Through an incision about three-quarters of an inch to the mesial side of the recent scar, I opened the abdomen and found a small adhesion strangulating a portion of the small intestine against the posterior parietal wall, just above and opposite the site of the recent incision. The bowel above this band was distended and the portion below it collapsed. The band was treated in the usual manner. Another adhesion was seen holding the bowel to the anterior abdominal wall at the site of the recent scar. This was likewise clamped, divided, and ligated. After all bleeding points were clamped and ligated, 250 ccm. of 2 per cent sodium citrate in 3 per cent sodium chloride solution was introduced and the abdomen closed in layers, using a continuous plain catgut suture for the peritoneum, a continuous No. 2 chromic catgut suture for the fascia, and a continuous black waxed silk suture for the skin. In addition, three tension sutures of No. 5 black waxed silk were used. As soon as the citrate solution was introduced the patient's respiration suddenly became very deep and slow, but soon returned to normal. He made an uneventful recovery. When discharged from the hospital November 27, 1914, he said he had some pain near the wound. This I believed, from his description, was due to an adhesion. He has remained well and when last seen, January 22, 1916, he was entirely free from any abdominal discomfort and felt perfectly well.

Although I used sodium citrate in this case, and the patient made an uneventful recovery, I do not feel that the recovery can in any way be attributed to the use of sodium citrate solution. If this case had come to me after I had finished the animal experiments above described, I should not have used the citrate solution.

In conclusion, I might summarize my impressions of the value of sodium citrate in dogs as follows: Sodium citrate solution is of no value at all in preventing the reformation of adhesions which have been separated. Sodium citrate solution is of little value, if of any at all, in preventing the primary formation of adhesions, and may interfere somewhat with wound healing.

NOTE.—Since the above paper was submitted for publication, two new articles have appeared on this subject: one by M. H. Walker and L. M. Ferguson (13), and one by Saxton Pope (14). These authors come to quite different conclusions as to the value of the citrate solution, than I found in dogs, though these observers did all their experimental work on rabbits. In neither of these articles do the authors refer to the poor results reported by Sweet, Chaney, and Wilson, who, as I, did their experimental work on dogs. Perhaps this may explain the discrepancy in the results.

Walker and Ferguson state that, "scratching the colon in many places over its proximal two or three inches, the scratches going through the serosa down to the submucosa, invariably caused firm adhesions," but they do not state in how many animals this was tried. They state further, "this technique—being easily duplicated and sure in its results" was used in all the experiments they reported. They do not, however, offer evidence to substantiate this statement that this technique is sure in its results. It is unfortunate that they failed to state the number of control animals used, for, without knowing the result in an equal number of control rabbits, it is difficult to determine the real value of the citrate experiments. Their statistics

show that there was a total absence of adhesions in only 17 of their 40 experiments tabulated.

Pope, in his recent article, admits that the citrate interferes somewhat with wound healing. He says, "The abdominal wounds do show more oozing during closure, but in no case has it seemed to lead to failure of union nor to post-operative bleeding."

Ten of his 400 human cases came to reoperation, and he reports that there was "marked improvement in all but 2 cases" though he admits that, "it is very difficult to judge the evidence thus afforded." It would be interesting to know how long after the primary operation these cases were seen for the second time, because this is an all-important point. As is well known, cases where adhesions are known to have existed, may, after the lapse of some time, show no adhesions whatsoever. Therefore, in this work on adhesions, the time element must be known, before one can interpret observations.

Pope, finally, states that we have convincing experimental evidence. I do not believe that the relatively small number of experimental and clinical cases reported by all workers, added together, can be considered sufficient evidence to prove such a question conclusively, and where different observers are divided in their findings, as in this case, the experimental evidence is not convincing. I believe a great many more observations will have to be made before we are justified in drawing final conclusions.

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# DEPARTMENT OF TECHNIQUE

## THE HETEROGENOUS INTRAMEDULLARY BONE-PEG; ITS POSSIBILITIES AND LIMITATIONS

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THE remarkably large number of recent articles dealing with the problem of the open repair of fractures is a graphic sign of rebellion against the Lane, Lambotte, and other less popularized methods having for their basis the use of non-absorbable material. While fully recognizing the great progress in the treatment of irreducible fractures of the long bones, which these methods have enabled us to accomplish, surgeons have gradually been forced to the conclusion that non-absorbable material seriously jeopardizes the end-results of their operative cases. It is manifestly impossible for any operator or institution to state what percentage of open fracture cases has had to have a Lane plate, wire, or screws removed after union has taken place. Individual experience teaches us that this class of cases almost always migrates from one clinic to another. That the percentage of such secondary work is large, is my firm belief. Those of us who have been fortunate enough to watch the *modus operandi* of Lane or Lambotte, must however recognize the fact that in all recent modifications of our procedure, the mechanics and aseptic technique of these men still forms the basis of our work.

The controversy over the respective functions of bone and periosteum remains as lively and as healthy as ever; the probabilities being that we are needlessly splitting hairs. What is much more important, to my mind, is the ultimate fate of any and all transplants. If an autogenous transplant lives permanently, its superiority over heterogenous living or dead (sterile) transplants leaves no room for controversy. Murphy states that "the transplant, no matter how small or how large it may be, is always absorbed." He considers all bone grafts as merely osteoconductive. Oechsner of New Orleans inclines to the belief that long-bone transplants are dependent for their success upon (a) the mechanical support of the bone itself, (b) the physiologic element of regeneration as conveyed by its periosteum, endosteum, and osteoblasts. Without adducing any experimental or clinical data, he then makes the statement that "for the present, a thorough applicability of heterogenous grafts has not been established." Phemister's experiments would tend to prove that the majority, if not all, of the cells of a transplant, with or without periosteum, fresh or boiled, ultimately undergoes necrosis and absorption. Davison and Smith are positive that transplants are not permanent entities and that they are eventually absorbed. It would therefore appear that, while living autogenous grafts with their periosteum, conduce to more rapid repair of fractures, and are probably indispensable in reconstructing bony defects, they nevertheless finally disappear. It takes time to obtain an autogenous graft, thereby lengthening the operation, increasing traumatism and, as recently reported by Dyas, a pathologic fracture of the tibia deprived of its crest is a possibility which must be borne in mind. The use of a portion of the fibula, as advocated and practiced by Davison, has decided advantages over the tibial transplant. A heterogenous graft, on the other hand, is always obtainable at any meat market, can be easily cut into the required length and thickness, is sterilized by boiling and keeps for months without becoming too brittle.

I began the use of sterile soup-bone intramedullary splints following the fracture of a fibula splint which I had used in a transverse fracture of the femur. The patient was not willing to sacrifice his remaining fibula, but consented to the use of a heterogenous peg. The result obtained in this case encouraged me to continue along the same lines.

### PREPARATION OF THE SPLINTS

Any of the long bones of a steer will answer the purpose. For repair of a femur, the splint

should be four inches long for transverse fractures, five or even six inches for very spiral or comminuted fractures, and approximately one-half inch in diameter; for the tibia or humerus, four inches long and from one-third to one-fourth inch in diameter. While a circular saw and lathe cutter give the peg a more cosmetic appearance, I have found an ordinary hand saw, chisel, and mallet sufficient. The splint is denuded of its periosteum, cut to the proper size, and boiled two consecutive days for two hours and one hour just before the operation. At the time of the operation, it has been my custom to fit the peg to the medullary canal and not to drill the canal to fit the peg. The mechanics and asepsis of Lane are strictly adhered to in every respect.

CASE 1. M. N., No. 555,525, entered Cook County Hospital December 25, 1914. While getting on a street car, the patient lost his balance and fell to the street, landing on his left knee. His left thigh became immediately and completely disabled and he was brought to the hospital in an ambulance. Examination showed a marked deformity of the left thigh, six inches above the knee with visible bulging at the outer part of the lower end of thigh caused by the upper fragment. There was three inches shortening. The skiagram taken on admission showed a transverse fracture of the lower third of the femur, the proximal fragment being upward and outward. Attempts at reduction were not successful.

First operation performed December 28, 1914. Usual preparation of entire limb with iodine. A five-inch incision was made along the outer border of the left leg, down to the fibula, four inches of which was resected with its periosteum. This was laid in sterile salt solution and a six-inch incision over the lower third of the left thigh was next made down to the bone. The fragments were delivered, bent at right angles; the edges were freshened and the primary clot removed from the medullary cavities. The fibula peg, trimmed to measure, was driven into the distal fragment for two inches and the remaining two inches fitted into the proximal shaft without any special difficulty. The incisions were closed with Michelin clips, without drainage, and a pelvis-to-toes cast applied. Both wounds healed *per primam*, the clips being removed through fenestræ six days later. Six weeks later the cast was removed, when motility and crepitus were obtained at the site of the fracture. The limb was again immobilized for five weeks, but motility of the fragments persisting, the patient was sent up for another skiagram which showed a transverse fracture of the peg. This accident must have happened while the cast was being applied. The patient, very much discouraged, refused to have his right fibula sacrificed, but consented to the use of a soup-bone peg. On March 22, 1915, the thigh incision was reopened, the broken fragments of the fibula pulled out, the edges of the fracture freshened and a four-inch soup-bone peg introduced. The wound was closed without drainage and a cast applied under my direct supervision. The result (see Fig. 1) was excellent; healing *per primam*. The cast was removed May 22. Union was firm with a large amount of callus. Patient began the use of crutches May 29 and left the hospital June 28. A skiagram taken June 26 shows a large callus with apparently a beginning absorption of the bone-peg, the outline of which is much fainter than in the previous skiagrams.

CASE 2. A. K., No. 557,543, entered Cook County Hospital January 20, 1915. The patient stated that he fell down a flight of stairs, but does not know how he landed. He suffered immediate disability in the right lower limb. On examination at the hospital, an angular deformity of the right thigh between the upper and middle thirds was found, the upper fragment being strongly abducted. There was a shortening of three inches. The entrance skiagram taken shows an irregular oblique fracture, five inches below the superior border of the great trochanter on the outer side. The upper fragment was anterior, with an outward and upward retraction of the lower fragment of three inches. Attempts at reduction having failed, the patient was operated upon January 25, 1915. Usual preparation. External femoral incision six inches long beginning near lower border of great trochanter. The edges of the fracture were freshened, the medullary cavities cleansed of the primary clot and a five-inch soup-bone peg driven into the upper fragment for a distance of three inches. By traction and angulation the distal canal was brought into alignment and the peg slipped in easily. The wound was closed without drainage. A Whitman abduction cast should have been applied in this case, instead of the ordinary one, and the cast, in view of the patient's age (65), should have remained on for at least ten weeks. Owing to the routine change of interne service, with its incident confusion, the cast was removed March 4 and a Hamilton splint applied. A skiagram taken March 16 shows that the peg has partly slipped out of the distal medullary cavity, allowing angulation to occur. Measurements taken at that time showed a bare half-inch shortening. As the patient was a poor surgical risk, a second operation or refracture of the femur was decided against. Firm bony union occurred, patient leaving the hospital June 28. I am convinced that a Whitman abduction cast, maintained for ten weeks, would have given us perfect anatomical as well as functional results.

CASE 3. P. A., No. 557,801, entered Cook County Hospital January 23. The patient had slipped on the sidewalk and fallen on his left leg, which at once became totally disabled. Examination showed angulation with abduction and eversion of foot and lower third of leg. There was a shortening of one-half inch. The first skiagram did not reveal the fracture of the fibula which was in its upper third; neither was it satisfactory as regards angulation and outward rotation of the lower fragment. Several attempts at reduction having failed, the patient consented to an open operation, which was performed February 1. Usual preparation, incision and exposure of fragments which were angulated and freshened, the medullary clots curetted out and a four-inch soup-bone peg introduced. Closure without drainage; plaster cast applied from the middle of the thigh to the toes. The cast was fenestrated and clips removed six days later when a superficial stitch abscess was found which healed rapidly. The cast was removed March 22. The final skiagram shows the bones and peg in excellent position. There is a rather large amount of callus present, several areas of which do not appear to be calcified. No shortening on measurement. The patient left hospital March 27, able to walk with the aid of a cane.

CASE 4. Comminuted fracture of right femur, lower third. Mrs. L. W., age 46, entered Cook County Hospital June 18, 1915. Through the courtesy of my colleague, Dr. Paul Morf, I was allowed the privilege of operating on this case. Repeated attempts at reduction had already been made; all had failed. The first skiagram taken shows a comminuted fracture of the lower and middle third of the femur with outward and backward displace-

Fig. 1. Skiagram showing the excellent result in Case 1.

ment of the fragments. A spicule of bone is seen in the distal medullary canal and the proximal fragment is displaced outwardly fully an inch. Operation July 9. Usual preparation and incision over the lower third of the femur. A number of small spicules were removed, together with the large one in the medullary canal. It was then noticed that both the proximal and distal portions of the shaft were fissured for a distance of two or three inches. The soup-bone peg which had been prepared for this case was only four inches long; it should have been five or six inches long in order to hold the shaft in good apposition. A satisfactory coaptation of fragments was extremely hard to obtain. The incision was closed without drainage and a body-thigh-leg cast applied. A skiagram taken on the following day shows complete reduction, with the largest portion of the peg in the lower fragment; the upper portion is in the medullary canal but does not entirely fill same so that apposition is not entirely complete. Infection of a moderately severe degree occurred and the cast was removed. The splints and traction which replaced it failed to prevent angulation. The patient left the hospital September 25, promising to return in two months for final disposition of her case. At the time of her departure the infection had entirely cleared up but there was only slight attempt at repair and the angulation persisted.

Fig. 2 (at left). Skiagram made on entrance of patient in Case 5.

Fig. 3. Skiagram showing perfect coaptation in Case 5 after operation.

In view of the comminuted condition of the femur, it is questionable whether a good result could have been obtained under any line of treatment. Nevertheless this case must be classed as an operative failure.

CASE 5. F. H., age 46, No. 573,539; the patient did not remember how the accident happened as he was intoxicated at the time. On examination a transverse fracture of the left femur, five inches above the knee, was found, the proximal fragment being anterior to and overriding the lower fragment for about two inches. The entrance skiagram (see Fig. 2), fails to show the full extent of the shortening. Reduction under ether narcosis having failed, the patient was operated upon August 3. Usual preparation and incision along outer side of femur. The fragments were freshened, the primary clots removed from the medullary canals after angulating the fragments and a four-inch long soup-bone peg was introduced by the usual technique. Closure of wound without drainage. Straight body-thigh-leg cast applied. Coaptation was perfect (see Fig. 3). Clips removed seven days later; healing *per primam*. Cast removed October 10; firm bony union present, no shortening. Patient left the hospital October 20. He will return once in three months and have further skiagrams taken to ascertain the length of time necessary for absorption of the peg.

CASE 6. J. R., age 32, No. 574,278, entered Cook County Hospital August 10, 1915. Sixteen days prior to admission the patient slipped and fell on the street, striking his left hip. He was unable to walk after the accident but remained at home in bed until brought to the hospital. On examination no deformity or swelling was visible; doubtful crepitus could be obtained on rotating

the femur in the region of the neck. There was extreme tenderness on pressure over the great trochanter and one centimeter shortening was demonstrable. The entrance skiagram showed a typical fracture of the neck of the femur. On August 16 he was anæsthetised, a short incision made over the great trochanter, traction and abduction applied, and two ten-penny nails were driven through the trochanter into the head of the femur. The usual body-to-toes cast was applied. The second skiagram shows the general position to be good. Healing of the wound *per primam*. The cast was removed October 11, at which time it was found that no union had occurred. A skiagram shows necrosis of the upper third of the head to have occurred, the nails now lying free in the acetabular cavity. On October 25 I again operated upon the patient, using Albee's[1] technique. Through the vertical incision along the inner border of the sartorious muscle and after separating the rectus and psoas as advised by Albee, I was able to get a very good view of the line of fracture. I then reopened the incision over the trochanter, and removed the two nails. By means of a hand drill, supplemented by a small concave chisel, I made a canal approximately one-fourth inch in diameter extending from the trochanter to the margin of the articular surface of the head. The depth of the canal was measured accurately and a piece of soup-bone of same dimensions was prepared and hammered in place. When fitted, it was found that the shaft and head of the femur moved as one piece. The fascia was coapted by means of interrupted catgut and the skin closed likewise with catgut stitches. Abduction cast applied. Wounds have healed *per primam*. The skiagram (see Fig. 4) shows the peg is not squarely in the center of the head, but the result should be excellent.

Fig. 4. Skiagram showing position in peg in Case 6.

## CONCLUSIONS

While realizing that the presentation of six intramedullary soup-bone peg cases cannot be considered as conclusive of its merits, I present this preliminary report in the hope that it may stimulate further effort along the same lines. The results thus far obtained certainly warrant a more extensive trial of the same heterogenous material.

[1] Ann. Surg., Phila., 1915, July.

# THE TECHNIQUE OF A NEW PROCEDURE FOR SUBTOTAL ABDOMINAL HYSTERECTOMY IN CASES OF UTERINE FIBROMA OR INFLAMMATION OF THE ADNEXÆ

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UTERINE fibroma and inflammation of the adnexa are frequently met with by the gynecologist and necessitate intervention. The technique of abdominal hysterectomy has been so perfected during the past twenty years that preference is given to the methods insuring the best results, in the shortest time, by the simplest technique. For a long time I have performed hysterectomy successfully by the technique described by Terrier, Richelot, Doyen, Pozzi, Jayle, Kelly, Kelly-Segond, and J. L. Faure. Except in inflammatory conditions or where there is a tumor involving the cervix, it is my experience that a subtotal abdominal hysterectomy is preferable, and herein I agree with the views generally expressed by surgeons.

It may be of interest to describe the technique I have been using for some time past. It is presented not as an original procedure but rather as an improvement over the other method in that it is a combination of the different methods I have used or have seen used by the various European gynecologists. It is founded on an anatomical basis and its simplicity justifies its presentation to my colleagues.

Figure 1 is a modified reproduction of a drawing from Faure and Syredey showing the vascular system of the female pelvis and its relation to the ureters. Between the peritoneal folds the uterus receives three groups of vessels. From above downward these are the ovarian, those connected with the round ligament, and the uterine. The latter at the uterine end turn sharply at right angles and encircle the ureter at a distance of one and a half centimeters from the point where the vagina bends back over the cervix, forming the lateral cul-de-sac. From here the uterine vessels ascend to the uterus and upon its lateral wall join the ovarian vessels. It is evident from this description that one ought to be able to control all of this circulation with one forceps provided the end of the forceps grasps the uterine vessels at a point directly above the ureter. The method I shall describe is based upon this fact. The steps are as follows:

1. *Median laparotomy incision.*

2. With a tenaculum or hysterolab the fundus is pulled as high as possible and then flexed forward toward the pubis as if it were to be delivered from the abdomen. The assistant now

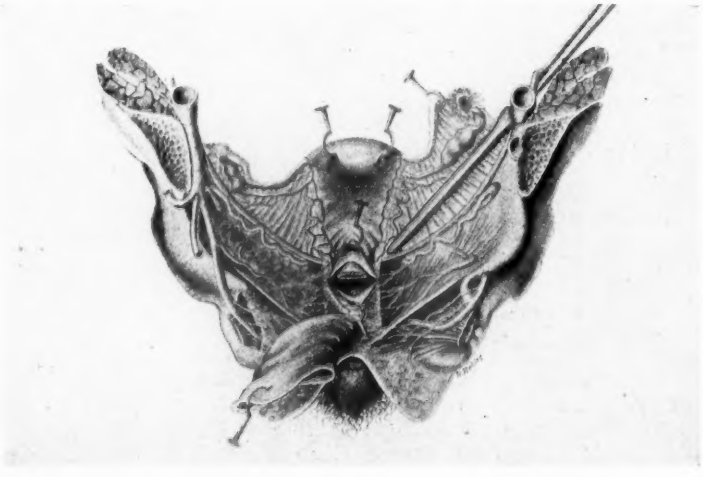

Fig. 1.

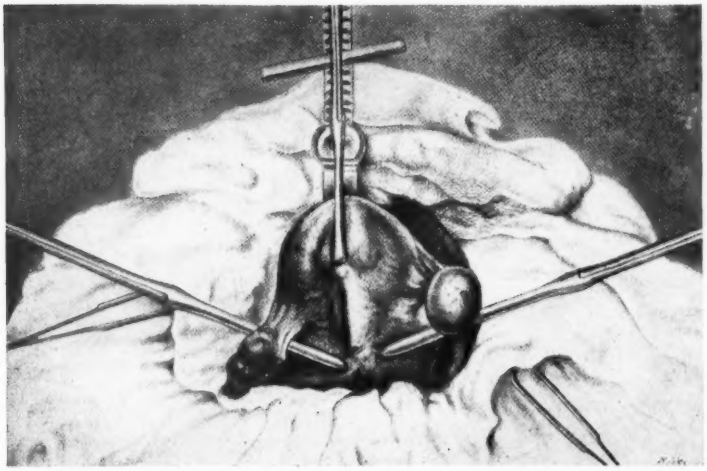

Fig. 2.

cares for this while the surgeon examines the uterus and adnexa, and pushes down the bladder so as to bring it and the ureters close to the pubis. The broad ligament is stretched out and brought within reach. The thumb and index finger of the left hand grasp the broad ligament just outside the adnexæ and seek the cervix through the walls of the vagina, ascending slowly from there to the point where the beating of the uterine vessels can be felt. This is the point where this artery crosses the ureter. The right hand now seizes a strong long forceps with flexible points and compresses the area covered by the thumb and index finger of the left hand.

3. *The whole breadth of the broad ligament* is thus compressed above the points of the forceps which touch the borders of the cervix. The forceps are slowly but tightly locked to completely close the three arteries of the uterus and to fix the two layers of the broad ligament in a constant

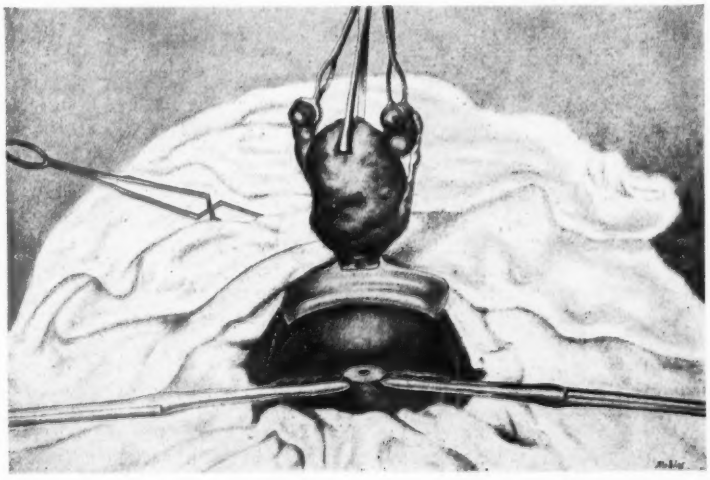

Fig. 3.

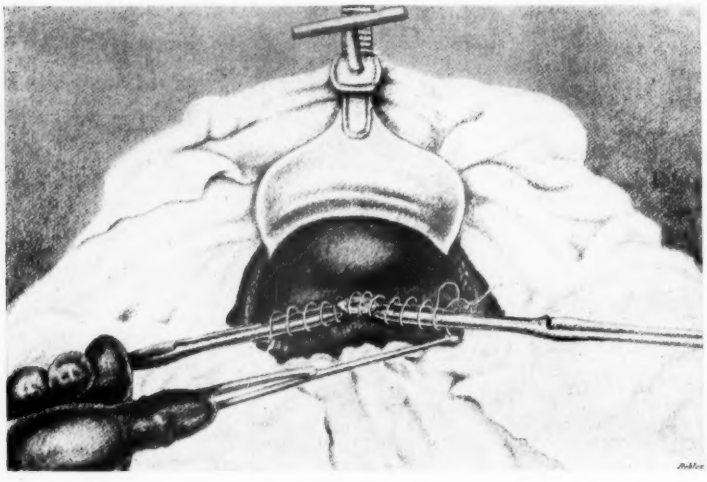

Fig. 4.

position throughout the operation. This I think is original and its advantages will be explained later (Fig. 2).

4. *Section of the broad ligaments and the cervix.* The assistant holds the uterus, and the surgeon cuts the two sections of the broad ligament with a pair of long, strong, curved scissors, following the edges of the closed forceps. The cut is carried out from left to right, so that first the proximal layer of the broad ligaments is removed, then the cervix at the level of the isthmus, and last the distal layer. The uterus and adnexa are thus removed. The remaining part of the cervix is seen at the base of the pelvis. The two forceps compress the parts of the broad ligament and the arteries, and the ureters and bladder, having previously been pulled forward, remain uninjured.

5. *The dressing of the bleeding surfaces.* If the ends of the uterine arteries are still visible, these are first ligated. If, however, the cut has been made too close to the forceps, each of the vessels is ligated by a U-shaped ligature to the surface of the cut, below the forceps. The ligature of the funicular and ovarian arteries is made in connection with performing the peritonization.

6. *Peritonization.* A long catgut No. 2 and a pedicle needle are used. Below the forceps the needle is passed all around the stem of the *pedicule infundibulum pelvicum.* This done, the loop is closed and the ovarian vessels ligated. Stitches are now made in such a way that the spirals formed by the catgut enclose both the borders of the remaining part of the broad ligament and the forceps compressing this part (Fig. 4). One of these spirals encloses the artery of the round ligament and suffices for the ligature of this vessel. From here the stitches are continued until the cervix is reached. The forceps compressing the sewed part of the broad ligament is now removed and the catgut pulled just as if it were a curtain string. Half the peritonization and the ligature of this part of the broad ligament is then finished. The ligature and the peritonization of the cervix and of the other half is accomplished in the same way. When one arrives at the last ovarian artery a small forceps is placed below the larger one compressing the ligament. This larger forceps is now removed and the catgut tightened. When the ovarian artery has been ligated the small forceps is also removed and the operation finished.

7. *Toilet of the abdomen.*

8. *Closing the abdominal wall.*

The technique described has the following advantages:

1. The use of comparatively few instruments; a knife, tenaculum forceps, two long forceps for the compression of the broad ligament, a pair of strong scissors, a pedicle needle, and a small forceps — altogether seven instruments.

2. Absence of bleeding. Compression of the blood-vessels is made without any difficulty at the very beginning of the operation. The broad ligaments are cut when compressed and the ligature is made before the forceps are removed.

Not a single drop of blood need therefore be lost; an advantage in patients weakened by hæmorrhage.

3. The two strong forceps fixed on the broad ligaments from the beginning of the operation insure the compression of the arteries, allow the cutting of both layers at the same level and at the same time, and prevent any blood from accumulating between the remaining parts of the layers. That the peritonization is so easy by this method is due, partly to the manner in which the suture is made, and partly to the fact that the ligature of the vessels and the peritonization are made simultaneously.

4. The value of my method from an anatomical point of view consists in the fact that care is taken to compress the ligaments with the two forceps from the beginning of the operation and to avoid injuring the bladder and the ureters.

Professor Pauchet at Amiens who has used my method emphasizes the following advantages:

*The advantageous fixation of the cervix.* It often happens that the vaginal wall prolapses after total or subtotal hysterectomy, because the cervix is no longer supported by the ligaments and therefore has a tendency to sink. Thanks, however, to the peculiar suture used in my method which unites the remaining parts of the ovarian arteries, the round ligament, and the cervix, a solid stem is formed by the peritoneal wall and these different parts which is capable of preventing the sinking of the cervix.

This method therefore is the preventive treatment against cystocele so well known to every gynecologist; it is the ligamentopexis of the cervix.

As the forceps are still compressing the ligaments when the peritonization is made, this procedure becomes an easy matter even in obese patients, in patients who are restless during the narcosis, or in patients who have exceptionally short ligaments.

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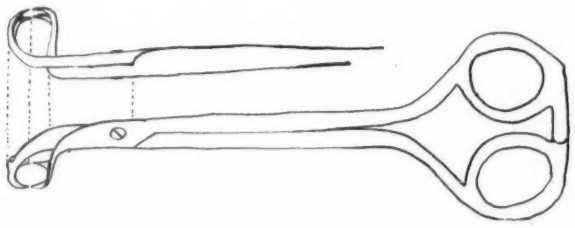
## AN IMPROVED TOWEL CLIP

By FRANCIS E. LOCY, M.D., Evanston, Illinois
House Surgeon, Evanston Hospital

THE need of a clip to fasten the lap-sheet or towel to the edge of the wound and thus reduce the chances of infection from or to the skin has led to the invention of various instruments.



The clip shown in the figure is a modification of previous instruments and has been devised to overcome some of the objections to the clips now in use. The salient features are a handle which will lie flat against the abdominal wall and which will not allow twisting of the skin by being bent over to one side as has occurred in other models in which the handle has been at right angles with the abdominal wall.

The handle may be straight as in the figure or slightly curved to adapt itself to the average curve of the abdomen. The lock and shape of the finger-holes is such that the chances of catching ligatures, etc., about the handle are reduced to a minimum.

# DYSTOCIA DUE TO ASCITES IN FŒTUS WITH PERSISTENT CLOACA[1]

## Report of Case

By KENNETH M. LYNCH, M.D., and ALLEN J. JERVEY, M.D., Charleston, South Carolina

ON October 5, 1915, one of us (A. J. J.) was called in consultation in a labor case as follows: The patient was an Italian woman, age 36, with negative family and personal history. Her first pregnancy, one year ago, ended with a full-term child which died shortly after birth as a result of difficult forceps delivery.

Labor had started at 5 a.m. and a female child was born, left occipito-anterior, without difficulty at 12:45 p.m., a dose of pituitrin being given at 12. Forceps had been applied to the second fœtus after a reasonable wait, and the head and shoulders finally delivered. No further progress had been made when the case was seen at 5:30 p.m. The fundus of the uterus was half-way between the umbilicus and the ensiform cartilage. It was about the size of an eight month's gestation, rather globular, and contained fluid under tension. The head was born and the shoulders filled the vulval outlet. The cervix was tightly contracted around the thorax. It was decided that a large meningocele was present. To give more room the head and arms were removed. A trocar was inserted into the fluctuant mass and about 1000 ccm. of clear straw-colored fluid drawn off, after which the unborn parts were readily delivered. A single placenta was delivered.

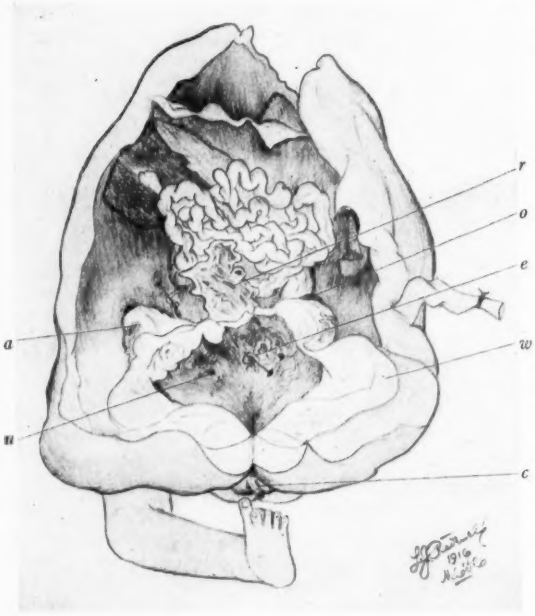



Fig. 1. Persistent cloaca with ascites. *a*, Hypogastric artery; *u*, opening of ureter; *r*, rectum; *o*, ovary; *e*, entrance of rectum; *w*, cloaca wall; *c*, clitoris.

*Gross specimen.* Body of a white infant. The head, shoulders, arms, and left leg had been torn off. There was an incision opening the abdominal cavity in the lower right quadrant. The external genitals consisted of a thick clitoris one-half an inch long and labia majora resembling a cleft scrotum. At the usual position of the anus there was a relaxed rounded opening showing a hymen-like membrane forming its anterior wall and extending in semilunar shape over the anterior part of the opening. The whole surface of the body appeared œdematous. The thorax was short and broad, apparently flattened by longitudinal pressure. The pelvis was in a similar condition. The abdominal wall was thick, especially in the lower half, being here of about one inch in thickness, and composed of mucoid œdematous connective tissue. The cavity was empty but showed indications of having contained about 1000 ccm. of fluid. The peritoneum was smooth and glistening. The liver was slightly small and brownish red in color. The kidneys and adrenals appeared normal and were in the usual positions. The heart, lungs, spleen, and stomach showed no gross change.

The whole of the intestine except the rectum was attached to a long apron-like mesentery suspended from just below the stomach. The rectum was the size of an adult thumb and was distended with a tough greenish mucinous material. It was on the right side, in the usual position of the cæcum, the upper end passing up to the left to join the large intestine on the mesentery. The lower end passed through the peritoneum at the brim of the pelvis in the midline posteriorly, where it was lost to sight. The whole intestine was markedly hyperæmic and all except the rectum was contracted and contained yellow mucinous material.

The pelvic organs except the undeveloped ovaries were not to be seen, as the pelvic cavity and all its contents appeared to be behind the peritoneum which was of ligamentous proportions in this region. On attempting to trace the pelvic viscera, the following conditions were found in this region:

Beginning at the umbilicus anteriorly, this forming the neck, and spreading out downward to fill the lower abdomen and up to the level of the lower pole of the left kidney, behind the peritoneum, was a sac large enough to admit the closed fist. Its walls varied in thickness from a few millimeters to one and one-half centimeters, and at the thinner portions yellowish calcareous bodies showed through. Its wall was composed of 3 layers: an outer fibrous layer; a middle, smooth muscular layer; and an inner, mucosal layer. The mucosa was hyperæmic; at places smooth, at others corrugated or polypoid, and these projections were covered with whitish flaky crusts which seemed to penetrate into the wall at points. This sac emptied through the pelvis and out of the orifice previously mentioned — there was no other external opening. It was entered above by the rectum at the place where it disappeared through the peritoneum, through an orifice admitting a very small probe. It was also entered by the ureters at normal appearing orifices at the upper right and

[1] From the Department of Pathology and Research Medicine, Medical College of the State of South Carolina, Charleston, S. C.

left corners. Small red undeveloped ovaries and parovarii lay under the peritoneum over the upper right and left surfaces of the cavity wall.

The hypogastric arteries were tortuous and thick-walled, passing through the œdematous, tough, ligamentous, outer coat of the cloaca.

*Summary of gross diagnoses.* Pressure deformity of thorax and pelvis. Unusual mesentery to whole intestine. Acute enteritis. False hermaphroditism. Undeveloped ovaries. Persistent cloaca with chronic inflammation of wall. Ascites. Œdema and fibrosis of abdominal wall. General œdema.

*Microscopic findings.* Heart and large vessels normal. The lungs were normal and unexpanded. The spleen was engorged with blood. The malpighian bodies were composed of only a few lymphoid cells around the arterioles. The kidneys were of the normal appearing fœtal type. The adrenals contained very little medullary and chromaffin tissue; the outer cells of the cortex stained well, the inner cells poorly. There was little vacuolization of cells; the vessels were congested; there were small hæmorrhages into the substance.

The liver showed slight periportal round-cell infiltration with congestion of the radicles, and the cells were small and contained brown granules of pigment. There was mucoid degeneration of the epithelium of the intestine with desquamation, marked hyperæmia especially of the mucosal capillaries, œdema, and slight leucocytic infiltration. As to the thymus, Hassall's corpuscles were small and not numerous. They were composed of rings of large hyaline flat cells or hyaline concentric ring-layers of non-nucleated material or a rim of hyaline cells or material with a body of granular cytoplasmic and nuclear particles in a space. The walls of the hypogastric arteries were thick with an increase of fibrous tissue in all coats. The tissue surrounding these arteries was densely fibrous. The epithelium of the lower abdominal wall was thin. The subcutaneous tissue was much thickened and was of a very loose, spongy, connective-tissue type. The cloaca was lined by stratified squamous epithelium throughout. The thick parts of the wall had the following appearance: The epithelium was of varying thickness, from two to ten cells, and was covered by a layer of stratified material resembling the corneum of the skin. Over the polypoid projections the epithelium was thin and the cells degenerated. The subepithelial coat was of loose connective tissue, thick, and encroaching on the muscularis. The smooth muscle coat was somewhat thicker than in the adult bladder wall. It was composed of irregular bundles and contained an equal amount of connective tissue. The outer coat was thick and composed of fibrous connective tissue. The vessels were congested and there were many clusters of brownish pigment throughout the wall. At the very thin parts mentioned previously, the epithelium was indistinguishable, and the whole wall was of hyaline connective tissue with scattered areas of calcification, congested vessels, and hæmosiderosis.

*Summary of microscopic diagnoses.* Acute catarrhal enteritis; spleen — congestion, hypoplasia of lymphoid tissue and malpighian bodies; adrenal — congestion, microscopic hæmorrhages, hypoplasia of medullary and chromaffin tissues; liver — chronic passive congestion, chronic portal hepatitis; thymus — hypoplasia and degeneration of Hassall's corpuscles; abdominal wall — œdema and fibrosis; hypogastric arteries — sclerosis; cloaca — chronic passive congestion, œdema, chronic fibrous inflammation, with hyalinization and calcification.

## SUMMARY

Here we have a case of monochorial twins, one a well-developed female, the other, also a female, with failure of development of the pelvic viscera beyond a certain point and a marked œdema. We believe that the underlying factor in the maldevelopment and the œdema was one of poor circulation with impoverished blood by reason of the stronger sister usurping the cream of the nutrition from the common supply or even bringing about a relative stagnation of the circulation in the weaker by reason of its superior power.

The case was interesting to us on account of the abnormality present and also because of the interference with delivery by the ascites.

# THE INTERNAL SPHINCTER AFTER PROSTATECTOMY [1]

By G. S. GORDON M.D., C.M., F.A.C.S., Vancouver, B.C
Urologic Surgeon, Vancouver General Hospital

A FAMOUS Danish surgeon once offered to furnish a volume of his mistakes for the edification of the International Technical Surgeons' Association. He thought his errors would teach more than his successes.

With this precedent I had intended to place on record three cases of occlusion of the internal sphincter following prostatectomy. The first occurred four years ago. The other two followed closely on each other quite recently. The condition in the last two was recognized and remedied. A further study of other cases then on hand convinced me that partial occlusion is frequent following removal of prostatic growths, and that this is insufficiently recognized or it would be better guarded against at operation. I have, therefore, added two cases of partial occlusion.

Adenomata in the prostate are commonly found on the sides and floor of the prostatic urethra. In the process of growth they usually amalgamate more or less, press on the internal sphincter, protrude through, and progressively dilate it. Not uncommonly a mass consisting mainly of the median lobe, so called, is thus grasped by the sphincter about its waist, its upper part free in the bladder in front of the trigone while its lower part is surrounded by prostatic tissue which is much attenuated by pressure of the growth.

From an operative standpoint, the intravesical lobe, if present, is of little interest. The embedded portions, however, claim our attention. Of these the intrasphincteric, besides holding the sphincter dilated, leaves a raw edge on enucleation which is important to remember and will be referred to later. The intraprostatic portion pushes itself under the trigone and the lateral walls of the bladder and on enucleation leaves an unsupported, somewhat crescent-shaped, flap of bladder-wall with the dilated sphincter on its free edge. This flap is usually deepest behind and defaults entirely in front except in those rare cases involving an anterior "lobe." Following enucleation of the adenoma its bed contracts at once but not enough to close the opening between the bladder and anterior urethra. Collargol skiagrams have been published showing this opening to be funnel-shaped with its mouth at the bladder neck and outlet at the external sphincter. These pictures show only the sides of the bladder merging with the sides of the new-formed urethra. I am sure they do not show the universal condition of the sides and they do not show at all what has happened at the posterior commissure. If at operation the internal sphincter of the bladder has entirely and permanently lost its function, such pictures will be obtained after healing. The loose flaccid bladder flap has applied its denuded side to the denuded bed of the adenoma and adhered to it, and the bladder cavity and newly formed posterior urethra are practically one. This does not always happen — perhaps it happens only infrequently. In a large proportion of cases the sphincter contracts more than the rest of the denuded cavity and does so immediately, and this contraction progresses with time as the circular fibers gain greater tonicity. In rare instances this contraction is so forcible that the raw edges of the sphincter are purse-stringed together, heal in apposition, and totally obliterate the outlet. In such cases a retention catheter or the passage of a sound would prevent complete closure, but then the sphincter opening will be at most only the size of the meatal opening because such instruments must pass through the meatus. The sphincter admits the tip of the finger and while a catheter may prevent its occlusion it does not guarantee that the sphincter at urination later will dilate to fingertip size. As a matter of fact this opening is often sclerosed by fibrous tissue in the process of healing and cannot dilate. In the common run of cases the bladder outlet is patent enough but even in these the contraction of the sphincter muscle on its edge raises the trigone part of the flap above the base of the bladder and causes more or less obstruction to urination. In ratio to the degree of this obstruction, the force required to empty the bladder is increased, back pressure persists preventing improvement in trabeculation or diverticulation, preventing retraction of overdilated ureters and renal pelves and the kidney itself at urination is thus periodically compressed from within. This valve has a pocket immediately behind it and tends to perpetuate a bas fond behind the trigone. Gravel tends to accumulate here and agglutinate into stone. All these sequelæ to obstruction favor continuance of cystitis and all are in ratio to the degree of obstruction. This valve action is not

[1] Read before the North-Pacific Surgical Association December 18, 1915.

theoretical merely, as I hope to demonstrate by the following cases. The actual closing of the bladder outlet by the sphincter muscle is also illustrated below, as well as the formation of stone from gravel in a retrovalvular pouch. I believe that although our results of prostatectomy are among the most satisfactory in surgery, they can be bettered in nearly all cases, by attention to this sphincter flap at the time of operation: chronic cystitis and pyelitis, to a continuance of which we have heretofore resigned ourselves, will show more improvement; urination will be less frequent and freer and life will be pleasanter and longer for these old men if this obstruction is removed.

CASE V (14.12.32). Partial obstruction following prostatectomy.

An excessively fat steam engineer 60 years old was referred by Dr. Maxwell for hæmaturia, lasting off and on for 22 months; frequency of urination; and dysuria. The urine was stringy, alkaline and bloody and contained triple phosphates. The stream was interrupted at times, slow and painful, but otherwise normal. On January 11, 1915, I removed a phosphate stone from the bladder and four days later a left lateral and middle lobe from the prostate. A bulging on the right side of the urethra was considered inflammatory and was left alone. Three days later the suprapubic tube was removed and on the ninth day a No. 27 sound was passed easily. The following weeks were stormy; a generalized eczema did not add to his comfort. Janet irrigation did not save him from epididymitis. His suprapubic wound opened and closed from time to time nor would it heal permanently when later on a catheter was left in for ten days. In time he left the hospital. His bladder was washed out frequently with silver nitrate 1:1000, urotropine was pushed, and once the internal sphincter was dilated to a No. 35 French. Finally on Jule 28 I reopened the bladder and found the internal sphincter raised above the trigone, of very small caliber and infiltrated by dense scar tissue. The bulging on the right side of the urethra had disappeared. Forceful generous dilatation of the internal sphincter, removal of the scar tissue about the abdominal fistula, and drawing together of the abdominal wound has given a result satisfactory to him. There is still a distinct check to the catheter on entering the bladder and his urine continues foul, but his general health is good.

CASE P (15.9.7). Partial obstruction after using Hagner's bag — Young's punch.

In September last a feeble man of 65 was referred to me by Dr. Weld. He gave the usual history of nocturnal urination for years and then intermittent catheter life. On entrance to the hospital he was delirious at times and his mental processes were slow, rambling, and inaccurate. The temperature was 102°, pulse 118, urine foul and malodorous; the bladder was greatly dilated; there was an inguinal rupture and protruding hæmorrhoids; the prostate was evenly enlarged; emphysema obscured the area of cardiac dullness; the heart sounds were clear but weak, regular and with no murmurs, the second sound slightly increased; systolic blood-pressure 128, diastolic 90; and the kidneys were negative to palpation. With the gradual drawing-off of the urine his condition improved but it was not till 18 days after that Geraghty's test indicated cystotomy under gas and oxygen, and three weeks more before prostatectomy could be done. Three lobes were removed and Hagner's bag used to control hæmorrhage. This was followed by a retention catheter. One month later, as his urine was still very cloudy and he had dysuria one day with a temperature of 100°, he was cystoscoped. The sphincter flap was elevated well above the floor of the bladder and had a polyp-like mass on it. The sphincter was trimmed with a Young's punch and his urination has been free since.

CASE M (14.11.1). Partial occlusion of the bladder following prostatectomy resulting in retention of gravel and the formation of secondary stone.

A feeble, puny man of 70, a jeweler, lame from a paralytic stroke 20 years ago, was referred to me by Dr. MacNaughton of Cumberland in November, 1914, for frequent, painful, and urgent urination, intermittent stream of poor projection and caliber, bleeding following catheterization, and urine foul with pus and phosphates. His prostate was enlarged per rectum and tender, but without adhesions to the surrounding tissues. Cystoscopically there were two lateral and one median lobes. There was no stone. On November 7, suprapubic prostatectomy was done. On November 24, he said he passed gravel per urethram. On the 26th, his wound was permanently closed and he was discharged on December 5, "well" and "with free stream." Cystitis remained as evidenced by the urine contents but he had passed no gravel for two weeks. One month later dysuria returned and he passed gravel. Later came ball-valve urination when standing but free urination on lying on his left side. For four months the condition got worse and then he returned and had three fasceted stones in the bladder crushed with complete relief. I have not heard from him since but assume gravel would not have stayed in his bladder to form stone unless it were pouched behind the sphincter. Unfortunately my notes do not state whether diverticula were present.

CASE S (15.9.21). Occlusion of the vesical outlet following prostatectomy.

A farmer 55 years old, referred by Dr. T. V. Hunter, had passed no urine without a catheter for 15 months. He had pain over the bladder, up the rectum, and in the glans penis. Coitus had been impossible because of the pain it caused. He had had no venereal disease, had never passed gravel or stone although at one time he had had pain over the right kidney extending down the front of the right leg. There was no tubercular history and no known chance of contracting tuberculosis. Systolic blood-pressure 144, diastolic 90. The heart was slightly increased in size and the pulse was intermittent. The urine was acid of a specific gravity of 1015 and contained some pus and blood. The prostate was almost of normal size to palpation. On cystoscopy the bladder capacity was four ounces; the bladder was trabeculated and slightly diverticulated. There were seen a median lobe and a large phosphate stone. On September 25, 1915, the usual prostatectomy was done. On October 4, a sound passed easily. On the 16th, the suprapubic fistula had become small enough to keep a large amount of urine in the bladder before bursting. He persisted in the statement that urine was coming per urethram and it was not till the 23d that this was found to be erroneous. The wound was then slit open and the internal sphincter found smoothly healed over. It was opened and stretched to admit the finger easily and a retention catheter left in for ten days. Seven days later retention again occurred and the suprapubic wound was reopened, Young's punch was used to remove a median ridge, and a retention catheter again inserted. On its removal on November 20, the stream was prompt and large and has remained so since. The fistula closed and infection and diverticulation has improved.

CASE R (15.8.26). Occlusion of internal sphincter following prostatectomy.

The patient, referred by Dr. A. W. Hunter, is a wiry type, 55 years old, and a watchman on the Canadian Pacific Railway. He is a widower. Two years ago he had been relieved of retention of urine by medicines. Cystitis was diagnosed then although he had never had symptoms of gonorrhœa, lues, or tuberculosis. Since then he has had nocturnal and diurnal incontinence at times. This was of a peculiar type in that it occurred only when lying down or sitting, not when standing or walking. It was associated with no pain or scalding. Six months ago a suprapubic cystotomy was done for recurring retention with cystitis and septic absorption. His condition improved with lavage; but the cystotomy wound did not heal. Dr. Hunter, the last of a number of physicians who had seen him, referred him to me three months ago. The prostate was normal to rectal palpation and showed no bulging into the bladder on cystoscopy. The bladder, however, was trabeculated, ureteral orifices gaped and the vesical sphincter was elevated; the fistula was dissected out and an adenoma the size of the end of one's thumb was removed from the prostatic urethra. In closing the bladder the wound was extended toward the apex for drainage and the original drainage wound which lay behind the symphysis was sealed up. A tube at the apex was left in 14 days to secure firm healing below it; nine days after operation a catheter would not pass although some urine came by urethra. Twenty-three days later the suprapubic wound was slit open on a director and the sphincteric opening was found completely occluded. The fibrous membrane across it was ruptured and the opening dilated. A catheter was left in the urethra and no urine subsequently reached the abdominal dressings. Three weeks later he left Vancouver free of all symptoms.

CASE D (539). Occlusion of the vesical outlet following prostatectomy.

The patient was referred by Dr. J. L. Turnbull. A growth of the size and somewhat the shape of a cricket-ball was removed in one piece by Freyer's method. This typically benign adenoma was pronounced malignant by a competent pathologist. My notes do not state the day a sound was passed but 20 days after operation the suprapubic wound was healed and retention occurred which was relieved by the passage of a small size coudé. At this time there was pain over the right kidney and pyuria. As dysuria persisted, a few days later a posterior Kollman dilator was passed and enlarged to a No. 37 French. There followed some relief but the stream became smaller and smaller until finally the suprapubic wound reopened and there were chills and fever. He persisted in having no further surgical interference and Dr. Turnbull tells me he died uræmic three years later. For three months before death urine came by rectum. That a sphincter so hugely dilated by this growth would contract down to obstruction point in 20 days is remarkable.

Four years ago the first case, the last here reported, presented itself and since then I had often speculated on the exact pathological condition present after this prostatectomy. The usual technique satisfied me for three years after this, and then came the deluge. I have already indicated that removing the valve on the urethral floor remedies the condition; but a review of cases in preparing this paper was necessary to bring home to me the desirability of dealing with this valve at the time that prostatectomy is done. I have demonstrated that neither sounds, indwelling catheters or maintained distention of the sphincter with Hagner's bag after the usual technique in removing the prostate are adequate. There are two courses open at operation: one to remove the crescent entirely, the other to split it completely through in the midline and on each side, making two flaps, applying the raw side of these flaps to the denuded urethra and holding them in place by a Hagner bag, which is used to control hæmorrhage but which is ideal for this purpose as well. In a few days the bag can be replaced by a mushroom-headed retention catheter, care being taken not to disturb the grafts. The first expedient will appeal to those who follow Albarran's teaching that a catheter should not be left in for fear of spreading infection; the latter to those, among whom I am at last a convert, who believe that back pressure of infected urine has already produced immunity in almost all of these cases and that the pressure of this foreign body in the urethra is not apt to cause deleterious absorption of toxines. The only cases I would not treat by flap-splitting are those having oncoming infection from beginning catheterization. I have adopted this technique too recently to be able to give you records of its value.

W. L. Rodman

## WILLIAM LOUIS RODMAN

TO master the principles that underlie the profession, and then to do the day's work — that is *grand business*. And that was the singular record of the late Dr. William L. Rodman. He held his profession as a great trust, and, with a mind big enough and broad enough for genuine leadership, with industry, confidence, imagination, and humor, all organized for effectiveness, he did the day's work. Dr. Rodman, whose name now passes into the history of medicine, was both scholar and medical philosopher. He conceived his trust as a human service; and, with research guided by trained imagination, with virile and fearless criticism, and with sound observation, he was an inspiring leader of men.

Dr. Rodman was born in 1858 in Frankfort, Kentucky. He received his early education at the Kentucky Military Academy, and on graduation from the Academy, began the study of medicine with his uncle, Dr. James Rodman. In 1879 he was graduated from the Jefferson Medical College, Philadelphia. After serving as an interne for one year, he entered the army medical corps, and for two years was stationed at Fort Sill, Indian Territory. Leaving the army service, he began the practice of medicine at Abilene, Texas. From this field of activity he was called to the University of Louisville as demonstrator of surgery; and from Louisville, in 1899, he was called to the Medico-Chirurgical College of Philadelphia as professor of surgery, which position he held to the end of his life.

Honored by positions of great influence in the profession, Dr. Rodman worked tirelessly for the advancement of medical education. His effort in this direction found most significant expression in the National Board of Medical Examiners, which he not only conceived, but, through many years of effort, brought into existence.

At the time of his death, Dr. Rodman was President of the American Medical Association, having been President of the Surgical Section of that association in 1897. In 1902 he was elected President of the Association of American Medical Colleges. In 1911 he was elected President of the Philadelphia Medical Club; and was a member of the American Surgical Association, of the International Association of Surgeons, and of the American College of Surgeons.

He was an associate editor of the *International Text Book of Surgery*, and the author of significant chapters to other medical works. The result of his studies on cancer attracted world-wide attention.

After an illness of but a few days, Dr. Rodman died at his home in Philadelphia on March 8, 1916. Whitman observed that there are doctors who are only doctors, and doctors who are not only doctors. Dr. Rodman was not only a doctor; he was one of the most important, valuable, and necessary of men in American medicine.

# TRANSACTIONS OF SOCIETIES

## CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD DECEMBER 3, 1915, WITH DR. WILLIAM R. CUBBINS, IN THE CHAIR

### WAX MODELS

DR. EDWARD H. OCHSNER: Wax has been used from time immemorial to preserve copies of the form and contour of different objects and also for the purpose of making records of events. I understand that within the past ten years a number of wax tablets have been discovered in Greece which are considered by archeologists to be the oldest records extant. One reason why wax is so useful for these purposes is because it is practically indestructible except to heat and mechanical insults. The ordinary micro-organisms, the micro-organisms that cause putrefaction, have practically no effect upon it.

In medicine wax models have also been used for many centuries most successfully for the purpose of recording form. Many attempts have been made to record not only the form but also the color, but most of these attempts have been more or less of a failure. The principal reason why they have been a failure in this regard is because artists have found it almost impossible to color wax without overcoloring it. Most of the wax figures I have seen have reminded me of the chorus girls in the vaudeville, they have too much paint on. The only wax models I have ever seen personally that were accurate copies of the originals were some of the wax models which I saw twenty years ago in Guy's Hospital in London. I suppose there are other artists who have succeeded in coloring wax and making it look natural, but if so their work has not come to my notice. The artist who made the wax models at Guy's refused to divulge his secret and with him his secret died. I very well remember, and I can visualize today, a wax model of Paget's disease of the breast by this artist. It is the most perfect object of medical art I have ever seen.

Last spring I became acquainted with a young Milwaukee artist who was at that time and is still making models of mushrooms and toadstools and puffballs for the Milwaukee Museum of Natural History. After speaking with this young woman, and especially after seeing her remarkable work in the Milwaukee Museum, it occurred to me that here was an opportunity of reviving a practically lost art. I suggested that she attempt to make wax models of pathologic specimens and to color them. Not being in active practice at the time, I had no clinical material at my disposal, but it occurred to me that my friend, Dr. Hodgson, of Waukesha, Wisconsin, might have suitable clinical material. It also occurred to me that a case of terminal gangrene either senile or diabetic would be particularly suitable for a trial. Dr. Hodgson has had marked success with diabetes and has achieved a national reputation in the treatment of the affection, and I thought that he might possibly have a case of diabetic gangrene on hand. I communicated with him, and within a week or ten days he called me up and said a case would be at our disposal at any time. Miss Allen, the artist, and I went to Waukesha. She made a plaster mold of the stump of the foot poured the mold and after this had set and hardened she colored it, and those who have seen the original and also the model agree that it is practically impossible to tell the two apart. The patient was an old woman, eighty-four years of age, who some three years previously suffered from senile gangrene of the foot, of type No. 1, as described by me in a paper on senile gangrene some years ago. She had spontaneous amputation of the toes, which left an ulcer. I understand no particular effort had been made by her family physician to heal this ulcer, because she was eighty-four years of age, and it did not seem worth while. The patient had been under Dr. Hodgson's care only a short time when I saw her.

The model which I pass around shows that the skin had been subject to the influence of secretions, hence is considerably reddened and there are flakes of yellow lymph here and there and a number of projections of epidermis. The model is an accurate copy both in form and color of the original.

Miss Allen, who is here, has brought with her this evening a cast of her sister's hand and a life mask of her sister. The sister has been good enough to come from Milwaukee, in order that the model may be compared with the original, so that you can judge for yourself as to the excellence of the work.

Miss Allen has also brought along a group of mushrooms which I think you will agree with me look good enough to eat.

It is rather humiliating for a Chicagoan to have to go to Milwaukee, in order to see certain museum specimens, but I cannot pass this subject without saying that Milwaukee has a remarkable man at the head of its museum who has gathered around himself a group of remarkable artists, and that in

this relatively small city there is one of the finest museums of natural history in this country, one that rivals in many respects and surpasses in some of its departments the Smithsonian Institute in Washington.

So far as I have been able to determine wax models have only a few minor disadvantages. They are rather delicate and must be handled with care. They must not be dropped or scratched. Since they have to be made by an expert they are somewhat expensive but I believe for the more rare pathological lesions and for permanent records they will be of very great value.

### ENDARTERITIS OBLITERANS WITH SYMPTOMS OF INTERMITTENT CLAUDICATION

DR. L. L. MCARTHUR: You all know the suffering, the tediousness, and the apparent hopelessness for any surgical relief of gangrenous toes incident to that peculiar vascular disease which, in the past, went under the term of intermittent claudication but has more recently been accepted as a thromboangiitis of Buerger. Because there seems to be some hope as a result of Koga's experiments in the use of the Locke or Ringer solutions I present a group of six cases. They have come into my service in the past six or eight months. They have all been sufferers either by a toe or a finger or the whole foot becoming at times black, at times blue, always painful, ultimately gangrenous, usually associated with a loss of pulse in the vessels of the foot, sometimes in the hand.

We now have to group gangrene cases into (1) syphilitic arteritis obliterans, (2) the thromboangiitis of Buerger, (3) diabetic gangrene and (4) arterio sclerosis (senile). The second subdivision is perhaps most emphasized by the intense neuralgia, by the cramps that come on in the early stage of the disease in the muscles of the calf of the leg. Usually after a very brief walk of two or three or four blocks cramps occur.

Here is a case, the inner side of whose foot was black and gangrenous. A portion has sloughed off, then healed over so well that you would not suspect such trouble to have existed. Healing has taken place by 1,000 ccm. of Ringer's solution, administered hypodermatically twice a week.

Here is a man who failed of relief by this treatment, having had twenty-eight injections in New York for a gangrene of his foot, which later they amputated. Both feet are now gone. He came to me to amputate the ring finger of the left hand. After having had twenty-eight injections elsewhere he refused to try it further. The finger was amputated. I present him as an interesting example of this disease affecting both the hands and feet.

The next patient I saw in February of this year. After having suffered for seven months with painful and ultimately gangrenous toes, the first toe, second toe, and little toe of both feet became black and gangrenous on their tips. He had prior to my seeing him been operated on for a gastric ulcer. This man was a pitiable object. He would cry when you went into the room. The slightest motion would cause pain. He lost all self-control. After the salt solution of Koga the gangrenous portion separated. The pain ceased. Where there was a dead terminal phalanx, it was lifted out. The areas have healed over with normal cicatricial material under this line of treatment.

We have had, as is rather natural, a number of such cases appear in the service at the Michael Reese Hospital since it is a disease peculiar to the Jewish people. The cases which I have had an opportunity to treat have been relieved of the pain, relieved of the need of taking morphia or anodynes of various types. Some have refused treatment because they had similar treatment elsewhere. The wounds healed slowly, taking six, eight, or ten weeks.

I want to show a case of gastro-enterostomy because of its interest clinically. One of our Fellows operated on this man some two years ago for a case that was clinically typical of a gastric ulcer. On opening the abdomen no evidence of ulcer whatever was found; there was a spastic pylorus for which a pyloroplasty was made. The symptoms continued. For a year and a half or so he has been trying various medications finally drifting into the Michael Reese Hospital where my colleague, Dr. Friedman, studied carefully his case with the X-ray. He discovered a persistent notch-defect far over on the left side of the cardia that showed up regularly in the skiagrams. Various other pictures showed it more markedly than the one I exhibit. The patient sought operative interference again. At operation the stomach appeared and felt absolutely normal to all intents and purposes; its emptying time was about normal. There was some hyperchlorhydria, and there was distress after eating. With the abdomen opened, I told Dr. Friedman that while there was no ulcer of the stomach, there was a tumor of the tail of the pancreas well to the left. I made a temporary opening into the gastrocolic omentum examined the posterior stomach-wall where an ulcer of crater type was found at the cardiac end which had made adhesions and inflammatory infiltration of the tail of the pancreas. Dissecting it loose from the pancreas, I succeeded in finding an ulcer of the stomach which had a perforation at its apex, excised the same, and then sutured the opening made by excising it. Remember, the stomach was everted and suturing had to be done on the posterior portion of the cardia and has resulted in the picture which now shows an almost hour-glass type of stomach because in suturing it narrowed the lumen there temporarily. This picture was taken three weeks after operation. From the time the man came out of the anæsthetic he has been free from pain.

I had a call suddenly to the Michael Reese Hospital from a man suffering from intestinal obstruction which had existed five days. He

having been operated on twice in other cities before coming here for the trouble which he had, was nevertheless not able to tell us just exactly what had been done at the time of admission. On examining him I found he was as tympanitic as one ever sees an abdomen and had gone a week without a bowel movement. On opening his abdomen I found an enormously distended sigmoid, as large as ever seen even in Hirschsprung's disease. The obstruction proved to be an enormously distended sigmoid volvulus. This is the third time he has had a volvulus, as we found out by writing to the surgeon who had operated on him on previous occasions.

I bring him here to suggest cases of volvulus of the sigmoid of this type are not an uncommon affection in which fixation or sigmoidopexy is advocated after having made a side-to-side anatomosis. In this particular case with a tumor simulating an enormously dilated stomach, it was easy to bring the two loops together, make a generous anatomosis, and then suture the two long loops together. These were emptied by introducing a tube into the rectum after having undone the twist, and the loops were then anchored at the umbilicus. It happened in this particular case that an adhesion which had occurred at the former operation was present on the inner surface of the abdominal wall and made a good peg on which to hang the top of the sigmoid, and since this has been done I do not think he will have any more torsion of his sigmoid.

DISCUSSION

DR. A. J. OCHSNER: Since Dr. Strauss reported at a former meeting of this society the treatment for this condition by means of Ringer's solution, we have had three cases, two with the condition described by Dr. McArthur, and one case of diabetic gangrene, with tremendous pain. In the latter case, the pain would stop only for a short time following the use of morphine, while it stopped for twenty-four hours after the use of Ringer's solution. The patient is a man for whom I amputated one leg five or six years ago for gangrene, and who returned with gangrene of the great toe, with excruciating pain, which we tried to control without success with morphine for a time. However, after I used Ringer's solution, the pain stopped immediately and he would remain free from it for twenty-four hours. He has been under treatment now for ten days, and four days ago we stopped the solution, after which the pain returned, but subsided again after giving 1000 ccm. of Ringer's solution hypodermically.

DR. DANIEL N. EISENDRATH: I have been much interested in this subject of thrombo-angiitis because we have had so many cases at the Michael Reese Hospital, and we are inclined to resort to conservative rather than radical measures such as we have undertaken in the past. The majority of these cases come to us with gangrene of one toe, and with such excruciating pain that even morphine will scarcely relieve them. The etiology of this pain is not understood. It is supposed to be an irritation of the nerve walls of the blood-vessel itself, and a measure has been tried by Dr. Lilienthal of New York recently, who claims that in these cases he has obtained immediate relief of the pain, by ligation of the vein of the extremity. I saw him do this recently in New York. I saw a case which Dr. Carl B. Davis of this city had of this kind at the Presbyterian Hospital in which I suggested that the same measure be tried after numerous attempts were made with Ringer's solution; namely, relieving the pain by ligation of the femoral vein.

In the majority of these cases we have been obliged to amputate high up, and the most successful amputation we have been able to do was the Gritti-Stokes. Usually the artery is found occluded as high as the point of the bifurcation of the popliteal.

Dr. McArthur in showing a number of these cases recently spoke of a case not long ago where the circulation had been re-established after the use of Ringer's solution. I believe this method has a very important place, because otherwise the radical measures are the only thing we can offer the patient.

The second case Dr. McArthur showed of ulcer of the posterior wall of the stomach is of considerable interest to me. I see so many cases laparotomized for suspected ulcer of the stomach, and the ulcer does not present itself on the anterior wall, the case being classed therefore as a mistake in diagnosis. I have employed an exploratory gastrostomy for the past two years. Whenever I am not sure of the presence of ulcer of the anterior or posterior wall of the stomach, and yet the symptoms are so typical of it, that I feel confident of it, and I see a slight induration on the wall of either the stomach or duodenum, I have done an exploratory gastrostomy. I make an incision two or three inches in length on the anterior wall of the stomach, about two or three inches proximal to the pylorus, and insert my finger into the stomach and explore it or evert the mucosa. It is a simple method and I can recommend it to you. You can actually palpate the ulcer if it is of any size. If you do not find the ulcer you can easily close up the opening. It is certainly something I can recommend.

DR. L. L. MCARTHUR: In regard to Dr. Ochsner's question concerning the nature of the solution, I would like to say that Ringer's solution is a standard one, the formula of which can be found in all physiologies. It is an official solution. Some have used the Japanese or Locke solution, which is also a physiological solution, which is as near an imitation of the blood salt as is possible to make in the laboratory. A very remarkable thing was noted in some of these cases and that was the absolute return of pulsation in the dorsalis pedis or tibialis posticus. In one case there was a return of the pulse at the wrist which everybody noticed as absent when the patient was admitted to the hospital. The nurse called attention to the fact that

the patient was pulseless, thinking it was very serious when taking the pulse and temperature for the record, but could not find it. After treatment the pulse returned definitely.

Dr. Strauss made a section of one of the arteries in a limb amputated a year or so ago for this affection by me at the Michael Reese Hospital. He found a normal posterior popliteal artery where it entered into the calf of the leg it had what appeared to be a new-growth in its lumen. This was an organized clot for a certain distance, perhaps three inches, below which a normal artery again presented. There seemed to be a plaque deposit on the interior of the vessel.

Buerger has shown sections of such deposits or organized thrombi through which small capillary vessels have gone or tunneled to make a passageway for the blood; there is an actual return of circulation in vessels that otherwise would have been not palpable.

In regard to this case of ulcer of the stomach, I think a compliment should be paid to Dr. Friedman in his careful study with the fluoroscope, taking a picture not in the ordinary conventional way, from before backward, but in an oblique position. It was in this way this ulcer was discovered.

## VARIED TOPICS CONCERNING THE SURGERY IN INFANTS AND YOUNG CHILDREN

Dr. Coleman G. Buford read a paper entitled "Varied Topics Concerning the Surgery in Infants and Young Children." (See p. 546.)

### DISCUSSION

Dr. Charles A. Parker: I have enjoyed Dr. Buford's exposition of this subject very much, and as I have worked with him I know just how true all of it is. I shall not attempt to add any original matter to what he has given you, but shall simply go over some general points as I have observed them, because I work in the same hospital with him, or did formerly, and all of you know what an interesting subject the surgery of childhood is. It is the most optimistic surgery we have.

We have the general processes of surgery as they affect children, and we know how quickly they react to serious operations accompanied by the loss of blood and loss of heat. And we have the many surgical conditions to which children are particularly liable, or the essential surgery of childhood, and they may be grouped under congenital conditions and those that arise more frequently in childhood. The congenital conditions occur from the head down, the hare-lip, the cleft palate, the hydrocephalus, and the various neuroceles down to the birth hæmorrhages that may bring on the later spastic conditions that need attention. Dr. Buford spoke of obstruction of the intestinal tract, particularly at the pylorus, and going farther down we come to the surgery of the urogenital region with the various kinds of penile and vaginal fistulæ, besides rectal closures, of which we have read so much in the newspapers very recently. Passing from those conditions we come to the deformities of the limbs which in many instances can be corrected by orthopedic surgery, such as birth deformities, club-feet, numerical and other variations of the digits, congenital dislocation of the hip and other rarer congenital deformities.

Again, in children, we get the tubercular infections in which the joints, the spine, the hips, knees and other regions are involved. Furthermore, we get the deformities due to rickets. We get those in children at the time they should be corrected. It is one of the best chances to use our favorite remedy in tuberculosis and in many other conditions, and no matter what our remedy is, if it does not do harm to the child, we can get favorable results. That makes us optimistic again. The child will grow up if you feed him. He will gain in weight and attain greater height as he advances in years.

Dr. John F. Golden: I presented a case today before the senior clinic of the Northwestern University Medical School which showed the result of an operation which I performed two months ago before the same clinic.

The child was referred to me by a pediatrician with the following history: The child at the time of birth weighed nine and a half pounds. At the time the child was presented to me it weighed five and a half pounds. In other words, the little one had lost during the two months of its life almost half of its weight — four pounds.

I did the usual posterior gastro-enterostomy and was surprised that the only place where the child lost much blood was when I made the incision through the stomach and jejunum. At this point a slight amount of blood was lost. I took the ordinary syringe filled with paraffin, sterilized and heated it, squirted out the paraffin, and drew two ounces of blood from the mother's vein and injected it subcutaneously into the child's breast. That was done two months ago and the child has gained a pound a month, and it is a perfectly healthy normal infant. Inanition at the time I operated was very pronounced. The skin was drawn over the child's bones.

In cases of extreme inanition and loss of blood, I shall be interested in hearing what Dr. Buford has to say, in his closing remarks with regard to the subcutaneous injection of blood.

Dr. D. W. Graham: It has been my custom to recommend operation for inguinal hernia in early childhood, because so many of these cases are seen in families in which the mothers have to take care of several other children, and under the circumstances a truss can hardly ever be well managed. Moreover the most humane thing we can do for a mother so situated is to operate, and I have always followed that course.

I have not seen the danger attending the administration of an anæsthetic to children that Dr. Buford

speaks of. While there may be a little more risk than in the adult, this can be eliminated with extra care on the part of the anæsthetist. Of course, the operation itself is more difficult than it is in an adult from the standpoint of the surgeon.

In regard to the infection of wounds that are liable to be soiled by urine, the urine of children is quite harmless, and wounds situated near the region in which soiling is likely to take place may be left without any dressing whatever if the diapers are changed whenever they are soiled. One may leave off all dressing, seal the wound with collodion, and these little patients are very much better cared for than if you put on a gauze dressing and expect it to protect the wound. Instead of a protection it will hold the urine, serve as a urinary poultice and be detrimental. I prefer this method rather than that which Dr. Buford has described in his paper.

Dr. Daniel N. Eisendrath: This subject of the surgery of children is one that is very important because, as Dr. Buford says, there are many deviations in children from the same conditions in adults, one of which he has referred to, and that is the question of acidosis. There are few children operated upon at the Michael Reese Hospital without having the urine examined for diacetic acid and acetone, and many a time we have avoided being led into trouble from having discovered this in time. Personally, I like to have the urine examined for two or three days afterward for the same condition. Many cases of vomiting, of delirium, of temperature going as high as 106° or 107° in the first forty-eight or seventy-two hours, have been easily explained by acidosis where there was no trace of infection whatever.

We give these children post-operatively, every four hours, four ounces of tap water, containing 2 per cent carbonate of soda and 4 per cent glucose. It acts better than anything else.

Dr. Buford mentioned the dressing in hernia cases. I do not think there is any more satisfactory dressing than the one he described but I believe that one of the best dressings for a hernia in a child is that which is used in the Hospital for the Ruptured and Crippled in New York. For every case of inguinal hernia, both female and male, the application of a plaster cast extending to the knees is a satisfactory form of dressing.

As to the question of intussusception, we try to do too much for these cases of intussusception. I have seen several of them recover after first doing an enterostomy, and four weeks afterward doing a radical operation. One case that baffled me a year ago was a small baby, three months old, brought from Michigan in the third day of intussusception. Any enterostomy would have been out of question. I resected 12 inches of the intestine, with successful outcome.

Dr. Buford has made another good point, namely, that we must be extremely careful about operating on children. We should operate on them as rapidly and with as little loss of blood as possible.

Dr. Paul F. Morf: When Dr. Buford spoke of the use of anæsthetics, he failed to mention local anæsthesia. I believe local anæsthesia with novocaine and adrenalin is a distinct advantage in some cases in infants and children.

I will mention a case of imperforate anus which I operated on some time ago in which I injected about a dram and a half of less than one half per cent novocaine solution with adrenalin. The operation was done almost bloodlessly and painlessly. The tissues could be followed down easily and the imperforate rectum was brought down to the anus without difficulty.

In another case of spina bifida, operated on with combined local and general anæsthesia, only a small amount of general anæsthesia was necessary. The injection of novocaine and adrenalin solution allowed the operation to be performed with but slight hæmorrhage. The child made a rapid recovery from the operation.

Dr. William R. Cubbins: With regard to recurrent intussusception, I believe that as we make better diagnoses of intussusception and get the cases earlier, and more cases recover there are going to be more recurrences than there have been formerly. It is for that reason I suggested paralleling the terminal portion of the ileum to the ascending colon, and suturing it there with three or four sutures or a continuous stitch. It only takes a few moments, and if it should adhere — and I see no reason why it should not — it would be impossible to intussuscept the two parallel bowels. I published an article on this subject in Surgery, Gynecology and Obstetrics. I believe there will be more use for this particular line of work in the future.

Dr. Coleman G. Buford (closing): In reference to the remarks of Dr. Golden will say that we are in the midst of research work and we are likely to try anything that seems reasonable which might be a benefit to the children among whom we work. Among those who have needed blood because of loss from acquired hæmophila or during operations we have not been impressed with the value of intramuscular injection of human blood or diphtheria or horse serum.

Dr. Beck: Any human serum?

Dr. Buford: No human serum but we have used the blood of parents.

In answer to Dr. Graham concerning the time to operate on inguinal hernias in infants and very young children I feel just this way about it. In special hospitals of any kind where services are presided over by men of diligence, common sense, and integrity, it is a good idea to follow their methods. In such institutions attention is centralized upon their special field. Methods advocated are usually the results of the compiled experiences of a large staff. In ten or twelve years' experience with the hernias in infants and childhood, on a very large scale, I do not think that any angle of the hernia problem has escaped our attention.

In reference to the contention that the truss is a

care to the mother of a child and a discomfort to the child will say that this is a mistaken idea. A proper truss which fits properly is worn without one being conscious of it. Mothers who do not speak our language are readily taught how to apply trusses. We bring them back once a week to show them their faults in managing a truss and in a little while they become very adept at it. The mothers of the poor children are the easiest to teach all of the technicalities connected with the use of a truss and it is a rare thing for us to see one who seems in the least careworn because of it. Difficulties arise because of improper selection of trusses and insufficient supervision of them during the first weeks of their adoption. This work should be done by the surgeon and not by truss fitters or salesmen in an instrument store. I think it is a dangerous thing to advocate routine operation for inguinal hernia in early life and it ought not to be encouraged by the surgical teachers of our country.

Dr. Cubbins has given us something new in his operation for intussusception, the suturing of the reduced gut to the colon. I have implicated such a reduced gut and sutured it with thirty-day chromic catgut to the abdominal wall and have had the intussusception recur in forty-eight hours and have had to resect the gut.

With reference to the goiter question as it concerns childhood will say that I usually see in the neighborhood of ten goiters every Tuesday afternoon, the number sometimes rises as high as twenty-two. Sometime ago I described a syndrome characterizing simple goiter and I now believe that this syndrome is the result of toxæmia. It is noteworthy that a hundred per cent of the children I have examined having goiters also have either had their tonsils removed or they are in such diseased states that they should be removed. A large majority contain pus or cheesy material, which is not discovered until the tonsil is everted and its base pressed upon. I have also discussed the usual seat in which goiters in children begin, the lower pole of the right lobe, which I also think bears direct relation to the reception of toxic materials deposited into the lymph-channels in this area from the lymph-channels of the thymus glands. We have had the best immediate results in cases who have developed goiter in the neighborhood of the pubescent period and whose goiters are large and boggy, showing no advance pathologic changes, such as nodules due to colloid accumulations or single or multiple adenomata. Nearly all of the cases of this group which have been operated upon have shown a very marked diminution in the size of their goiters within ten days. I would like to say just a word about fractures in infants and small children. We become too much alarmed at angulations occurring in fractures in early infancy and we are plating little children entirely too frequently. Let us take for example birth fractures of the humerus, showing overlapping and considerable angulation. Splints do not always correct the difficulty. That seen on the X-ray plates may strike us with horror because of the excessive deformity. Extension and position will do much but time will help us out more than is commonly supposed. In a year there may be no external deformity and the X-ray plates may show bone without angulation of good contour; the medullary canal will frequently be shown to be re-established.

Vertical extensions in fractures of the femur in the earliest months of child life are used over time. Let us take more pictures of these fractures and study the value of different positions rather than resort to this common practice of making vertical extension in the fracture of all little babies.

## A REPORT OF A SERIES OF UNUSUAL FÆCAL AND GENITO-URINARY FISTULÆ TREATED WITH BISMUTH PASTE

Dr. Emil Beck read a paper entitled, "A Report of a Series of Unusual Fæcal and Genito-Urinary Fistulæ Treated with Bismuth Paste." (See p. 507.)

### DISCUSSION

Dr. A. J. Ochsner: From the time that Dr. Beck exhibited his first series of cases nine years ago, we have used the treatment in an enormous number of cases, and I can confirm everything that Dr. Beck has said. Any surgeon who uses the bismuth paste carelessly and does not fill the sinuses slowly, will be disappointed; whereas the surgeon who follows carefully and implicitly the directions laid down by Dr. Beck and fills the sinuses slowly with the paste, giving the bismuth time to get into all the bifurcations, and continuing the treatment properly, will get the most satisfactory results.

I believe we should use this treatment more frequently in cases of tuberculous kidney. We have used it in a number of these tuberculous kidneys with old sinuses in which in former years we would certainly have removed the kidney. We have had a number of these patients in whom a tubercular kidney had been drained elsewhere, that have been well now for years from the use of bismuth paste. It has seemed to me that possibly we would have to change the rule that we have maintained; namely, that in cases in which we have tuberculosis of one kidney, or a tuberculous abscess, we should remove that kidney at once. Possibly with the observation of a larger number of cases we may come to the point of draining such kidneys and using the bismuth paste regularly.

Dr. Phemister: I would like to ask as to the results obtained in cases of old empyema.

Dr. E. W. Andrews: I will answer Dr. Phemister's question. An old empyematous cavity that is producing constant toxæmia and has refused to heal for years has been cured by one injection clinically, not after a lapse of a certain number of days or weeks, but in a few minutes. We have had a number of such cases. This is a paradox of course, because the sinus is not cured but only masked. A

young lad, who had for about three years a chronic running chest, with daily fever, some emaciation, once in a while chills, and a rather copious fetid discharge in spite of going around to the various clinics and having had irrigations, had the sinus injected with bismuth paste by one of my assistants. It was done without much result because the directions were not carefully followed as laid down by Dr. Beck and mentioned by Dr. Ochsner. The paste was injected with a small syringe, but not deeply enough. Next time I took a catheter and passed it to the remotest corner or lowermost pocket of the sinus and injected into it eight ounces of paste. From that moment the boy was apparently well. His fever stopped that day, and he never had a drop of discharge. In two or three days he appeared to have no longer a sinus, but there was a minute invisible sinus which would only admit a pin pointed probe, and from it minute crumbs of the bismuth paste were of course escaping. Under X-ray examination it took several months for the last of that paste to disappear, but it came out in almost microscopic particles. The boy and his friends thought he was cured instantaneously, for the reason that he never had a particle of visible discharge and never had a soiling of dressings.

The case I have related is not atypical. I have seen the same thing in several cases of bad empyema — cases we used to do Estlaender and Schede operations on.

Dr. Beck does not claim the treatment is particularly adapted to anorectal fistulæ; nevertheless, I know of a number of cases which have been and can be cured by a single injection, and more especially those cases in which there are multiple sinuses. Some of them remain cured; some recur. Some are cured for a year, and some are cured permanently, but I never saw one that was not markedly benefited.

Dr. William Fuller: Until I heard the case related by the previous speaker I thought I had had the most unique cure, or the most prompt cure from the use of the bismuth paste.

Several years ago a woman consulted me regarding several fistulous openings she had near the anal orifice, for which seven different operations had been unsuccessfully performed. Not desiring to add another failure in an effort to relieve her, I injected these fistulæ with bismuth paste for the purpose of getting a skiagraph, to get if possible, some idea as to their location, direction, and depth.

The skiagraph showed these fistulæ to run on both sides of the rectum and as high up as the pelvic brim and around close to the lumbar vertebræ. While trying to determine some kind of rational treatment for this patient she returned in a few days and stated that the openings had not discharged since the injection of the paste. Another examination disclosed the correctness of her statement. She returned for a third examination a few weeks later, and also a year later, and the fistulous openings had all closed, and in their places were only faint scars. She appeared perfectly well.

Dr. Vernon C. David: I have had several cases of anorectal fistula in which I have injected the bismuth paste, and with some exceptions the treatment has been a failure. Some of these sinuses have closed, but the great majority of them have opened secondarily. I think one of the important reasons for failure of bismuth paste in anorectal fistula probably is the size of the internal opening in the rectum, because some of the cases that have recovered and have not had a recurrence, had small sinuses and small or non-demonstrable internal openings. In those fistulæ that had a demonstrable opening at the mucocutaneous line the bismuth paste had no curative effect.

Dr. Emil G. Beck (closing): In answer to Dr. Eisendrath regarding the woman with tubercular kidney, I will say that we do not have to remove every tubercular kidney. We remove it when it is acutely inflamed or involved in tuberculosis just as we would resect a joint that is acutely inflamed with tuberculosis in its beginning stages. I have treated hundreds of cases where abscesses have formed in joints, and they have healed. We do not have to resect a kidney after it has evacuated all tubercular material and there is nothing but the scars and connective tissue.

The important point I have tried to impress by the exhibition of these cases is that such patients can be cured by the bismuth paste, without resorting to hazardous operations.

Dr. McArthur: Do you get any more cases of bismuth poisoning?

Dr. Beck: We have treated 1,800 cases and have not had a fatal case. The first case of bismuth absorption reported in the literature was one of my own, but I think my published articles have taught physicians how to prevent bismuth poisoning. In the last three years there has not been a case of bismuth poisoning reported, although the paste is being used more extensively now than ever. It is being used in twenty of the military hospitals in France, introduced there by Carrel, who writes that there are thousands of cases in which it will be employed — since practically all gunshot and shrapnel wounds become infected, and chronic suppuration results.

# CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 5, 1915, WITH THE PRESIDENT, DR. S. C. PLUMMER, IN THE CHAIR

## STUDIES CONCERNING THE SURGICAL ANATOMY OF THE PARATHYROIDS

DR. EUGENE H. POOL, New York City, read a paper entitled "Studies Concerning the Surgical Anatomy of the Parathyroids."

## THE EFFECT OF FOREIGN SUBSTANCES IN THE PERITONEUM

DR. WILLIAM R. CUBBINS and DR. JOSEPH A. ABT (by invitation) contributed a joint paper entitled "The Effect of Foreign Substances in the Peritoneum." (See p. 571.)

### DISCUSSION

DR. JOHN L. YATES, Milwaukee, Wisconsin: Some years ago a series of experiments was undertaken to determine the effect of foreign bodies upon the peritoneum. We attempted to find out the underlying factors in the causation of these adhesions and their solution, and came to the conclusion at the time that no foreign body, except blood-clots under some conditions, could be so bland as not to provoke adhesions, and these adhesions, when once formed, would not disappear from surfaces not subjected to motion in contrary duration. At that time, when I was associated with Dr. Ochsner, there were opportunities to make similar observations in the human following appendicostomies and colostomies. It was then determined that the reaction of the human and dog's peritoneum to irritation was quite identical in character and in rate of production.

Dr. Cubbins is to be commended for attacking such an important problem, and need have no reluctance in applying the results to human beings because of the threadbare argument that dogs and human beings react so differently.

I would like to ask Dr. Cubbins if the pus he used in his mixtures with antiseptics has been tested out by itself in the peritoneal cavity? It would be expected that such injections would cause peritoneal irritation, but no fatal peritonitis, because we found the most virulent micro-organisms could be injected into a dog's belly without causing the death of the animal, unless some foreign body was inserted. However, these animals were all narcotized which might readily explain variations.

DR. DAVID C. STRAUS took part in the discussion; for his remarks, see article page 602.

DR. WM. R. CUBBINS: I was glad to hear what Dr. Yates had to say concerning pus in the peritoneal cavity. The dogs into the peritoneum of which I put a mixture of pus and salt solution died within 48 hours. One died as early as 18 hours. This pus was so fatal that I did not think it was necessary to mention the fact that a fatal result had occurred.

## EXPERIMENTS AND CLINICAL OBSERVATIONS ON THE ETIOLOGY AND THE DIAGNOSIS OF CHOLECYSTITIS, ESPECIALLY IN WOMEN

DR. V. L. SCHRAGER read a paper entitled "Experiments and Clinical Observations on the Etiology and the Diagnosis of Cholecystitis, Especially in Women."

# BOOK REVIEWS

## A CRITIQUE OF NEW BOOKS IN GYNECOLOGY AND OBSTETRICS

By GEORGE GELLHORN, M.D., Saint Louis

IT is an interesting coincidence that three obstetricians of foremost rank in this country have presented us with their works within the last few months and have given us an opportunity to compare their positions and experiences regarding the problems of obstetric practice.

Cragin[1] puts on record in a volume of 858 pages the methods in use and the results obtained in the Sloane Hospital for Women in New York. We gain insight into an exceptionally large material at the disposal of the author when we read of a series of 35,000 consecutive deliveries, of 223 cases of placenta prævia, 181 cases of transverse presentation, 150 cases of cæsarean section, etc. This large material has been carefully tabulated, and the statistics obtained have furnished the author with a firm and sound foundation upon which he bases his deductions and conclusions. The book is divided into 29 chapters which are arranged in 6 parts comprising: anatomy and embryology, physiologic pregnancy and its management, pathologic pregnancy, pathologic labor, obstetric surgery, and pathologic puerperium.

As the book is primarily intended for the use of the undergraduate student, the author has endeavored to cover the extensive field in as concise a manner as possible and to eliminate unnecessary discussion. With this in view he has made no effort to present a complete bibliography, although references to important articles on most subjects are given. The desire to guide the student and the young practitioner through the labyrinth of obstetric practice is apparent throughout the work. "The fact of a pregnant woman placing herself and her unborn child unreservedly in the care of an obstetrician carries with it greater moral obligation on the part of the latter to be loyal to her in every way than does any other engagement in medicine." The uncertainty of the summons, the long hours of waiting, the liability to criticism — these are the disagreeable features in the practice of obstetrics, which every student should carefully consider before selecting it as a lifework. But weightier than these are the satisfaction that comes with successful work, the happiness it creates, the affection it begets.

The chapter on management of normal labor contains practical hints as to every detail of preparation of the patient and her surroundings. Antepartum douches should not be given. Vaginal examinations are essential but should be made as infrequently as possible, consistent with the knowledge needed. The correct mode of putting on rubber gloves is well depicted. When he advises short motor rides for pregnant women or suggests that a nurse should be at the home of the patient at least a week prior to the calculated date of labor, the author forgets for the moment that he is speaking to beginners whose clientele would hardly warrant such luxuries. In the question of rest in bed after confinement the author follows conservative principles. The patient leaves her bed on the tenth day; "at the end of three weeks she walks about the floor and at the end of four weeks she is allowed downstairs and out for a drive." Ward patients, on the other hand, leave the hospital, on an average, on the thirteenth day.

It seems doubtful to the reviewer whether circumcision on baby boys requires anæsthesia as the author demands, or whether such an operation is often needed for the long, tight prepuce of the female baby.

The differential diagnosis of pregnancy and the chapter on ectopic gestation are excellent in their clearness and conciseness. Twins occurred 244 times in 20,000 deliveries which gives a percentage of 1.22, or about 1 in 82. An interesting contribution is added to the question whether ovulation may occur independently of menstruation. The author had to remove the ovaries from a woman who had not menstruated for seven years and found a fresh corpus luteum in one ovary, showing that the woman was ovulating inspite of her amenorrhœa. As to anæsthesia in the second stage of labor, the author uses ether in all cases of toxæmia and chloroform in normal cases. Spinal anæsthesia is justly advised against. After a year's experience with "twilight sleep," the author concludes that the advantages of the method in the majority of cases are not sufficient to counterbalance the disadvantages. Episiotomy is not recommended, and an extensive laceration of the perineum is more likely prevented by delivering the anterior shoulder first.

In a series of 25,000 deliveries, placenta prævia occurred once in every 112 cases. The sovereign method of treatment is the extra-ovular use of the Voorhees' bag, version is usually not required. Only in cases of emergency may packing with gauze and

[1] Obstetrics: A Practical Textbook for Students and Practitioners. By Edwin Bradford Cragin, A.B., A.M. (Hon.), M.D., F.A.C.S. Philadelphia and New York: Lea and Febiger, 1916.

Braxton Hicks be resorted to. Cæsarean section is reserved for exceptional cases of the complete variety with cervix undilated and hæmorrhage profuse. In the treatment of pre-eclamptic toxæmia, copious colon irrigations with saline or soda solutions and the administration of chloral, nitroglycerin, and particularly veratrum viride play an important rôle. If the toxæmia does not improve markedly or an eclamptic seizure occurs, the uterus is emptied at once. Stroganoff's method is not recommended. The mortality from eclampsia is at present 11.2 per cent. Fibroids rarely obstruct labor. Only in 9 out of 89 cases was special treatment required. Osteomalacia occurred once in 20,000 cases. High forceps was applied rather more frequently than might seem desirable; namely 218 times in 2,468 forceps operations, or once in every 92 instances.

Thirty-two pages are devoted to the problems of lactation and infant feeding. The student will do well in his own interest and that of his patients, to carefully peruse this chapter and make the author's views his own. The prime importance of breast feeding is fully emphasized. The principles of artificial feeding are clearly set forth but the reader is made to understand that all resonable efforts toward the stimulation of the mother's breast must be exhausted before artificial feeding is resorted to. Realizing the difficulty in instructing the laity, especially the ignorant women of a hospital ward service, in percentage feeding, the author has arranged an apparatus which, at a nominal cost, can be placed in the hands of women leaving the hospital and which will enable them, after having been once shown, to prepare a proper food for their baby, even should they know nothing of percentage feeding. This apparatus is called the Sloane Maternity Milk Set, and the description accompanying the set is reproduced in the text.

The concluding chapter of the book deals with infant mortality and the results obtained are given in the form of several statistical tables. An analysis of 10,000 births shows that after the deduction of stillbirths and abortions and after the further deduction of cases of congenital syphilis, weakness, and malformations, the total number of deaths was only 184 or 0.2 per cent.

In this rapid survey, only scant justice could be done to the wealth of information contained in this book. We are glad that the author has permitted us to share in the treasury of his rich experience, and we welcome his work as a valuable and permanent addition to obstetric literature.

DE LEE'S[1] contribution is an imposing volume of almost 1,100 pages. The fact that the first edition had to be reprinted several times, and that in two years a second edition has become necessary would in itself suffice as a favorable commentary. But the reviewer has so greatly enjoyed the perusal of this book that he cannot refrain from pointing out at least some of its many admirable features. First of all, the illustrations are bound to attract the reader's attention. There are 938 of them, and they are truly excellent. It has repeatedly been insisted upon in these pages that good pictures are an essential and indispensable part of a modern textbook, particularly in the field of gynecology and obstetrics. They are primarily needed to render subject matter more intelligible to the beginner whose limited experience has not yet taught him to think, and with his mind's eyes to see in three dimensions. In addition, they directly stimulate interest and desire to learn. The picture of the interlocked twins, for instance, is bound to make the student anxious to find out how the author succeeded in dealing with so interesting and complicated a problem. Examples of illustrations that teach almost without accompanying words are those of compression of the aorta, replacement of the prolapsed cord, massage of the breast, fœtal circulation, etc. It was a genuine pleasure to find the portrait of Semmelweiss. The reviewer does not recall at this moment any other textbook that contains so thoughtful a tribute to the memory of the great benefactor of parturient women.

In the text itself, an extensive experience, mature judgment, familiarity with the world's literature, and above all an exceptional gift for teaching manifest themselves on every page. Wherever one happens to open the book, one is impressed with the clearness and directness of the author's expressions that can leave no doubt in the mind of the reader. A textbook for students must needs be more or less dogmatic; yet, the author possesses the rare faculty of remaining unbiased when personal experience is not sufficient to entitle him to an authoritative opinion. For example, his results with the classical cæsarean section have been highly satisfactory, yet, he concedes that the newer extraperitoneal methods deserve further trial.

The principle of Abderhalden's test and its future possibilities are set forth with remarkable precision; the various steps of the technique are omitted as only experienced laboratory workers may be trusted with the complicated and exacting details, and the reader is referred to several American writers who have taken up this method. Patients are kept in bed until the ninth or tenth day postpartum. Getting up too early seems to increase the frequency of fever in addition to other untoward sequels. In vertex presentations, the posterior shoulder is first delivered. Episiotomy is warmly recommended "it will save the lives of many children and often preserve the sphincter ani from injury." Scopolamine-morphine amnesia is discussed fully and impartially, but the author fears that its generalized re-employment will result in a repetition of the fœtal and maternal mortalities and the morbidity of twelve years ago. Gas-oxygen analgesia has a place in obstetrics, but oxygen must be liberally ad-

[1] THE PRINCIPLES AND PRACTICE OF OBSTETRICS. By Joseph B. DeLee, A.M., M.D. Philadelphia and London: W. B. Saunders Co., 1915.

mixed to prevent asphyxia neonatorum. The treatment of postpartum hæmorrhage is accorded an extensive discussion, and the various methods are well depicted, including even Momburg's belt, the limitations of which, however, are clearly pointed out. In eclampsia, prevention is more promising than treatment. Of the various forms of diet, salt-free diet has been disappointing. Increased excretion is essential, but diuretic drugs are not recommended. Sweating is dangerous and inefficient, while hypodermoclysis, on the other hand, is most valuable. In the treatment of eclampsia, the author advocates early delivery; he doubts the value of veratrum viride and is frankly opposed to renal decapsulation. The chapter on placenta prævia contains a masterly description of the entire treatment. Metreurysis is employed intra-ovularly. Vaginal cæsarean section in placenta prævia is not to be recommended, but abdominal cæsarean section is a valuable method in certain cases.

It may be argued that this review does not contain any real criticism, but what of that? We might wish that the author had devoted more space to physical exercises in the puerperium, or we might look with skepticism upon local applications of a 10 per cent solution of silver nitrate as a treatment of hyperemesis, but such minor exceptions may be withheld when dealing with a work of superior merit which is well suited to bear the fame of American obstetrics to foreign countries.

Strictly speaking, Green's[1] work does not belong in this symposium on textbooks of obstetrics. It deals with diseases of women in general, but as it includes abnormalities of pregnancy, labor, and puerperium, it may be reviewed here from this point of view. The author has chosen the form of case histories to illustrate pathologic conditions characteristic of the five periods of woman's life. The attempt at thus closely linking together the sister sciences of gynecology and obstetrics is heartily to be endorsed, and the value of this system of case teaching has been fully acknowledged in a previous review.[2]

The arrangement of the book is briefly as follows: It is divided into five large sections devoted, respectively, to infancy and childhood, puberty and adolescence, maturity, climacteric, and anility. Each section is prefaced by a short introduction and a survey of the various affections to which the epoch in question is prone to be subject. The bulk of each section is made up of illustrative cases. In each of the 173 cases reported, a short history is given which is followed by the diagnosis as based upon the findings on examination. Treatment and prognosis form the ensuing paragraphs to which pathologic reports are frequently appended. Finally, there is a comment in which, in epicritical fashion, the differential diagnosis is discussed and general conclusions are introduced.

It is to be understood that the book aims, not to substitute, but to supplement the more systematic textbooks. It reproduces accurately the manner in which bedside instruction is given to a group of students. Lengthy discussions are avoided, the salient points are only briefly touched upon, a certain knowledge of clinical and technical matters is taken for granted, and only here and there is a diagnostic or practical detail dwelt upon at length.

It is difficult and not always feasible to classify all gynecologic ailments according to the age of the patients. Ovarian cysts may occur in childhood as well as in later years, and malignancy may be observed prior to the climacterium. The reviewer has only recently seen an inoperable cancer of the cervix in a girl of nineteen. Classification according to the most prominent symptom would *a priori* seem preferable were it not for the fact that most gynecologic affections produce more or less the same kind of symptoms. The author has overcome the difficulty of finding the case in which the reader may be particularly interested, by an extensive table of contents and a carefully worked out index.

Of the many chapters that one may read with interest and profit, the discussion on fever in the puerperium deserves special mention. After having cited instances of bacterial pyrexia, the author lays stress on fever due to extragenital causes such as constipation, gastro-intestinal irritation, psychical disturbances, earache and sinusitis, urticaria. It is to be hoped that the beginner will heed such wise counsel and carefully weigh all points before resorting to the popular procedure of invading the freshly delivered uterus and thereby subjecting his patient to grave and frequently unnecessary risk. In the prevention of eclampsia, the author has been most successful. Only once in 38 years of private practice did a case of toxæmia reach the stage of convulsions. In the treatment of eclampsia, profuse sweating is practiced, but veratrum viride and pilocarpin are condemned. As an anæsthetic for eclamptic patients, anæsthol is preferred to either ether or chloroform. Anæsthol is a mixture of ether, chloroform, and ethyl chloride in which the latter ingredient secures and maintains the necessary anæsthesia with so small an amount of the anæsthetic that the irritating effect of the small amounts of ether and choroform is negligible. In patients exsanguinated from an ectopic pregnancy or placenta prævia, transfusion of blood is advocated.

A teacher of wide experience and a humane physician reveals himself in this book, and the student will undoubtedly be stimulated to observe his own cases more carefully and systematically and thus to attain the standard set for him by the author.

[1] Case Histories in Diseases of Women. By Charles M. Green, A.B., M.D. Boston: W. M. Leonard, 1915.

[2] Surg., Gynec. & Obst., 1915, xx, 500.

# Clinical Congress of Surgeons of North America

SEVENTH ANNUAL SESSION
PHILADELPHIA
OCTOBER 23 TO 28, 1916

# CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA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## PLANS FOR THE PHILADELPHIA MEETING

ON the following pages is presented a preliminary schedule of the clinics and demonstrations to be given by the clinicians of Philadelphia during the seventh annual session of the Clinical Congress of Surgeons of North America to be held in that city the week of October 23, 1916. It will be understood that the published schedule is a tentative one and is to be amplified and corrected from month to month as the work of the Committee on Arrangements progresses, so that the final program will fitly represent the clinical work of the Philadelphia surgeons.

The Committee on Arrangements has planned a complete showing of Philadelphia's clinical facilities in every department of surgery, including gynecology, obstetrics, genito-urinary surgery, orthopedics, surgery of the eye, ear, nose and throat, together with many demonstrations on border-line subjects. Members of the Congress who were privileged to attend the second session, held in that city in 1911, will recall with great pleasure the splendid clinical program afforded by the Philadelphia surgeons at that time and will look forward with interest to a second opportunity of visiting that city.

Programs for a series of evening meetings are being arranged by the Executive Committee of the Congress. The presidential meeting takes place on Monday evening, at which time the President-Elect, Dr. Fred B. Lund of Boston, will deliver the annual address. On the following evenings, excepting Saturday, there will be sessions of the section on general surgery in the Ball Room of the Bellevue-Stratford, at which papers will be read by visiting surgeons who have been selected because of their special fitness to discuss the subjects under consideration. A series of meetings for the section on surgery of the eye, ear, nose and throat is also to be arranged for.

### LIMITED ATTENDANCE

Following the precedent established at the London meeting in 1914 and at the Boston meeting in 1915, attendance at this meeting will be

limited in number. A careful survey of the operating amphitheaters, lecture rooms, and laboratories of the several medical schools and hospitals in Philadelphia, as to their capacity for accommodating visiting surgeons, will be made and the limit of attendance will be based upon the result of this survey. The popularity of these meetings has become so great that the plan of limiting the attendance and requiring advance registration has been decided upon to prevent overcrowding. This plan has worked satisfactorily at the two previous meetings, as it assures accommodations at the clinics for all who hold membership cards.

Within a few weeks an announcement of the plans for the Philadelphia meeting will be sent to all members of the Congress with the advice that advance registration will be required because of the limited attendance. Already a number of applications for membership cards for the Philadelphia meeting have been received at the office of the Secretary-General and it is expected that the limit of membership will be reached long in advance of the date of the meeting.

### HEADQUARTERS

Headquarters will be established at the Bellevue-Stratford where the Ball Room, Clover Room, Red Room, Green Room, and adjacent foyers and smaller rooms have been reserved for the use of the Congress. These rooms are located on the second floor of the hotel and provide ample space for registration rooms and ticket bureau, bulletin boards, etc., the Ball Room being used for the evening meetings.

Headquarters will be open on the afternoon of Saturday, October 21st, and on Sunday, the 22d, for the registration of members. The program of clinics and demonstrations for Monday will be bulletined on Saturday afternoon, and on each afternoon, beginning Monday, the complete program for the next day's clinics will be posted on bulletin boards in headquarters. A printed program will be issued each morning and special tickets for all clinics and demonstrations will be issued to members at 8 a. m. each day of the session.

### SPECIAL TICKETS

The use of special tickets at previous sessions has fully demonstrated the efficacy of this method of providing for the distribution of members among the various clinics. To prevent overcrowding, tickets for any clinic or demonstration are limited in number to the actual capacity of the room in which the clinic or demonstration is to be given. These special tickets will be issued at 8 o'clock each morning for the clinics and demonstrations to be held that day, a complete clinical schedule having been posted on the bulletin board on the afternoon of the preceding day, and a printed schedule of the clinics distributed early each morning.

### REGISTRATION FEE

The constitution of the Congress provides that a registration fee shall be required of each member attending an annual meeting, there being no annual dues for members of the Congress. The registration fees provide funds to meet the expense of preparing for and conducting the annual meetings so that no financial burden is imposed upon members of the profession in the city entertaining the Congress.

# PRELIMINARY CLINICAL PROGRAM

## GENERAL SURGERY

KATE W. BALDWIN — Woman's Hospital.
M. BEHREND — Jewish Hospital.
JOHN A. BOGER — Stetson Hospital.
LEON BRINKMAN — St. Agnes Hospital.
J. B. CARNETT — University Hospital.
J. CHALMERS DACOSTA — Jefferson Hospital.
HARRY C. DEAVER — Episcopal and Woman's College Hospitals.
JOHN B. DEAVER — German and University Hospitals.
GEORGE M. DORRANCE — St. Agnes Hospital.
E. L. ELIASON — Howard and University Hospitals.
M. FRANKLIN — St. Joseph's Hospital.
CHARLES H. FRAZIER — University Hospital.
JOHN GIBBON — Jefferson Hospital.
NATHANIEL GINSBURG — Mt. Sinai and Jewish Hospitals.
L. J. HAMMOND — Methodist Hospital.
CHARLES HASSAU — St. Joseph's Hospital.
EDWARD B. HODGE — Presbyterian Hospital.
JOHN F. X. JONES — St. Joseph's Hospital.
J. H. JOPSON — Presbyterian and Polyclinic Hospitals.
JAMES A. KELLY — St. Joseph's Hospital.
ERNEST LAPLACE — Medico-Chirurgical Hospital.
HIRAM R. LOUX — Philadelphia General Hospital.
EDWARD MARTIN — University Hospital.
BERNARD MENCKE — Stetson Hospital.
GEORGE P. MUELLER — St. Agnes and University Hospitals.
DAMON B. PFEIFFER — University Hospital.
G. G. ROSS — German and Stetson Hospitals.
FRANCES R. SPRAGUE — Woman's Hospital.
MAX STALLER — Mt. Sinai Hospital.
FRANCIS T. STEWART — Jefferson Hospital.
WILLIAM J. TAYLOR — St. Agnes Hospital.
T. TURNER THOMAS — University Hospital.
WILLIAM H. TULLER — Jewish Hospital.
H. R. WHARTON — Presbyterian Hospital.
A. D. WHITING — German Hospital.
A. C. WOOD — Howard and University Hospitals.

## GYNECOLOGY AND OBSTETRICS

*Monday*

THEO. A. ERCK — Gynecean Hospital — 10 to 1.
BARTON COOKE HIRST and JOHN COOKE HIRST — Howard Hospital — 11.
E. E. MONTGOMERY — Jefferson Hospital — 11 to 1.
JOHN M. FISHER — St. Agnes Hospital — 9 to 11.
WILLIAM D. CULIN — West Philadelphia General Homeopathic Hospital — 10.
LIDA STEWART COGILL — Woman's Hospital — 9.
SARAH H. LOCKREY — Woman's Hospital — 10.
JOHN G. CLARK and staff — University Hospital — 9 to 12.

*Tuesday*

GEORGE W. OUTERBRIDGE — Gynecean Hospital.
BROOKE M. ANSPACH — Gynecean Hospital.
EDWARD P. DAVIS — Jefferson Hospital — 11.
E. E. MONTGOMERY — Jefferson Hospital — 1 to 2.
JOHN H. GIRVIN and GEORGE E. SHOEMAKER — Presbyterian Hospital — 12.
JOHN A. MCGLINN — St. Agnes Hospital — 11.
P. BROOKE BLAND — St. Joseph's Hospital.
BARTON COOKE HIRST — University Hospital — 9.
SARAH H. LOCKREY — West Philadelphia Hospital for Women — 11 to 1.
ELLA W. GRIM — Woman's Hospital — 9.
MARIE K. FORMAD — Woman's Hospital — 10.

*Wednesday*

THEO. A. ERCK — Gynecean Hospital — 10 to 1.
BARTON COOKE HIRST and JOHN COOKE HIRST — Howard Hospital — 11.
E. E. MONTGOMERY — Jefferson Hospital — 11 to 1.
JOHN M. FISHER — Philadelphia General Hospital — 10 to 11.
JOHN A. MCGLINN — St. Agnes Hospital — 11.
P. BROOKE BLAND — St. Joseph's Hospital.
J. C. APPLEGATE — Samaritan Hospital — 11 to 12.
BROOKE M. ANSPACH — University Hospital — 9 to 12.
CAROLINA M. PURNELL — Woman's Hospital — 10.

*Thursday*

GEORGE W. OUTERBRIDGE — Gynecean Hospital.
JOHN G. CLARK and staff — University Hospital — 9 to 12.
BROOKE M. ANSPACH — Gynecean Hospital.
JOHN M. FISHER — Jefferson Hospital — 12 to 1.
JOHN H. GIRVIN and GEORGE E. SHOEMAKER — Presbyterian Hospital — 12.
JOHN A. MCGLINN — St. Agnes Hospital.
P. BROOKE BLAND — St. Joseph's Hospital.
WILLIAM D. CULIN — West Philadelphia General Homeopathic Hospital — 10.
SARAH H. LOCKREY — West Philadelphia General Homeopathic Hospital — 11 to 1.
M. LUISE DIEZ — Woman's Hospital — 9.
SARAH H. LOCKREY — Woman's Hospital — 10.

*Friday*

THEO A. ERCK — Gynecean Hospital — 10 to 1.
BARTON COOKE HIRST and JOHN COOKE HIRST — Howard Hospital — 11.
JOHN A. MCGLINN — St. Vincent's Hospital.
MARY T. MILLER — Woman's Hospital — 9.
CATHERINE MACFARLANE — Woman's Hospital — 10.

*Saturday*

JOHN G. CLARK and staff — University Hospital — 9 to 12.
P. BROOKE BLAND — Jefferson Hospital — 11 to 1.
BARTON COOKE HIRST — University Hospital — 9.

*Days to be announced*

WM. R. NICHOLSON — Methodist Hospital.
STEPHEN E. TRACY — Stetson Hospital.
GEORGE M. BOYD — Medico-Chirurgical and Philadelphia Lying-In Charity Hospitals.
RICHARD C. NORRIS — Methodist Hospital.

## ORTHOPEDIC SURGERY

*Monday*

J. T. RUGH and staff — Methodist Hospital — 4 to 5.
A. P. C. ASHHURST and A. B. GILL — Episcopal Hospital — 2 to 4.

*Tuesday*

J. T. RUGH and staff — Methodist Hospital — 4 to 5.
H. A. WILSON and staff — Jefferson Hospital — 11 to 1.
W. J. TAYLOR and staff — Orthopedic Hospital — 11 to 1.
J. P. MANN — Medico-Chirurgical Hospital — 2 to 3.
HARRY HUDSON and staff — Samaritan Hospital — 2 to 4.
G. G. DAVIS and staff — University Hospital — 2 to 3.

*Wednesday*

J. T. RUGH and staff — Methodist Hospital — 4 to 5.
A. P. C. ASHHURST and A. B. GILL — Episcopal Hospital — 2 to 4.
G. G. DAVIS and staff — University Hospital — 2 to 4.

*Thursday*

J. T. RUGH and staff — Methodist Hospital — 4 to 5.
H. A. WILSON and staff — Jefferson Hospital — 11 to 1.
G. G. DAVIS and staff — Orthopedic Hospital — 11 to 1.
J. P. MANN — Medico-Chirurgical Hospital — 1 to 3.
J. K. YOUNG and staff — Polyclinic Hospital — 2 to 5.
G. G. DAVIS and staff — University Hospital — 2 to 3.

*Friday*

J. T. RUGH and staff — Methodist Hospital — 4 to 5.
G. G. DAVIS — Widener School — 2 to 4.
G. G. DAVIS and staff — University Hospital — 2 to 3.
J. K. YOUNG and C. H. GRAY — Philadelphia General Hospital — 2 to 3.

*Saturday*

J. T. RUGH and staff — Methodist Hospital — 4 to 5.
A. P. C. ASHHURST and staff — Orthopedic Hospital — 9 to 11.
H. A. WILSON and staff — Jefferson Hospital — 11 to 1.

## GENITO-URINARY SURGERY

L. T. ASHCRAFT — Hahnemann and Woman's Homeopathic Hospitals.
H. M. CHRISTIAN — Medico-Chirurgical Hospital.
H. R. LOUX and staff — Jefferson Hospital.
T. R. NEILSON — University Hospital.
E. H. SITER — Philadelphia General Hospital.
E. H. SITER and staff — University Hospital.
B. A. THOMAS — Polyclinic Hospital.
A. A. UHLE and WILLIAM MACKINNEY — German Hospital — Monday and Friday.

## ROENTGENOLOGY

*Monday*

SIDNEY FELDSTEIN — Jewish Hospital — 3 to 4. Obscure and interesting fractures.
W. S. NEWCOMET — Presbyterian Hospital — 2 to 3. Bone lesions. Sinus cases (in conjunction with Dr. Stauffer).
GEORGE E. PFAHLER — Medico-Chirurgical Hospital — 2:30 to 3:30. Roentgentherapy in the treatment of deep-seated malignant disease.

*Tuesday*

DAVID R. BOWEN — Pennsylvania Hospital — 1 to 2. Fractures.
FREDERICK C. HUTTON — 1438 N. 15th St — 10 to 12. Organic lesions of the stomach and duodenum.
W. F. MANGES — Jefferson Hospital — 2 to 3. Pyeloscopy and pyelography.
W. S. NEWCOMET — Presbyterian Hospital — 2 to 3. Bone lesions. Sinus cases (in conjunction with Dr. Stauffer).
GEORGE E. PFAHLER — Medico-Chirurgical Hospital — 2:30 to 3:30. Roentgen diagnosis of gastric and duodenal lesions. Lantern slide demonstration.

*Wednesday*

W. F. MANGES — Jefferson Hospital — 2 to 3. Fluoroscopy of the gastro-intestinal tract.
W. S. NEWCOMET — Presbyterian Hospital — 2 to 3. Bone lesions. Sinus cases (in conjunction with Dr. Stauffer).
GEORGE E. PFAHLER — Medico-Chirurgical Hospital — 2:30 to 3:30. Roentgen diagnosis of gall-stones.
DAVID R. BOWEN — Pennsylvania Hospital — 1 to 2. Bone and joint diseases.
M. K. FISHER — Stetson Hospital — Joint diseases and radiography of the urinary tract.

*Thursday*

DAVID R. BOWEN — Pennsylvania Hospital — 1 to 2. Surgical diseases of the thorax.
SIDNEY FELDSTEIN — Jewish Hospital — 3 to 4. Tuberculosis of the lungs.
FREDERICK C. HUTTON — St. Mary's Hospital — 3 to 5. Intestinal pathology.
W. F. MANGES — Office — 2 to 3. Brain tumor and intracranial lesion.
W. S. NEWCOMET — Presbyterian Hospital — 2 to 3. Bone lesions. Sinus cases (in conjunction with Dr. Stauffer).

*Friday*

DAVID R. BOWEN — Pennsylvania Hospital — 12 to 1. The management of small and medium-sized hospital roentgen laboratories.

W. F. MANGES — Office — 2 to 3. Roentgen examination of teeth as an aid to surgical diagnosis.

W. S. NEWCOMET — Presbyterian Hospital — 2 to 3. Bone lesions. Sinus cases (in conjunction with Dr. Stauffer).

GEORGE E. PFAHLER — Medico-Chirurgical Hospital — 2:30 to 3:30. Electro-coagulation in the treatment of malignant disease.

M. K. FISHER — Stetson Hospital — Joint diseases and radiography of the urinary tract.

*Saturday*

DAVID R. BOWEN — Pennsylvania Hospital — 12 to 1. The management of small and medium-sized hospital roentgen laboratories.

W. S. NEWCOMET — Presbyterian Hospital — 2 to 3. Bone lesions. Sinus cases (in conjunction with Dr. Stauffer).

*Days to be Announced*

HENRY K. PANCOAST — University Hospital — 9 to 10, Radium therapy; 3 to 4, Gastro-intestinal tract.

## SURGERY OF THE EYE

*Monday*

WILLIAM CAMPBELL POSEY — Howard Hospital — 2.
S. LEWIS ZIEGLER — Wills Eye Hospital — 2.
SAMUEL D. RISLEY — Wills Eye Hospital — 2.
MCCLUNEY RADCLIFFE — Wills Eye Hospital — 2.
WILLIAM M. SWEET — Wills Eye Hospital — 3.
PAUL PONTIUS — Wills Eye Hospital — 2.
L. PETER — Polyclinic Hospital — 1.
PAUL PONTIUS — St. Joseph's Hospital — 3:30.
MIRIAM M. BUTT — Woman's Hospital — 2.
MARY BUCHANAN — Woman's College Hospital — 2.
FREDERICK KRAUSS — Episcopal Hospital — 2.
LEWIS LOVE — St. Mary's Hospital — 3.
AARON BRAV — Jewish Hospital — 3.
E. D. FUNK — Jefferson Hospital — 2.

*Tuesday*

E. D. FUNK — Jefferson Hospital — 2.
WILLIAM T. SHOEMAKER — Pennsylvania Hospital — 2.
GEORGE S. CRAMPTON — Pennsylvania Hospital — 2.
WILLIAM W. SPEAKMAN — Hahnemann Hospital — 2.
WILLIAM CAMPBELL POSEY — Wills Eye Hospital — 2.
P. N. K. SCHWENK — Wills Eye Hospital — 1:30.
T. B. HOLLOWAY — Polyclinic Hospital — 1.
MARY BUCHANAN — Woman's Hospital — 2.
G. ORAM RING — Episcopal Hospital — 3.
AARON BRAV — Lebanon Hospital — 2.
H. F. HANSELL — Philadelphia General Hospital — 2:30.
MCCLUNEY RADCLIFFE and J. M. GRISCOM — Presbyterian Hospital — 2.
WILLIAM ZENTMAYER — Wills Eye Hospital — 2.
G. E. DE SCHWEINITZ and J. T. CARPENTER — University Hospital — 3.
G. E. DE SCHWEINITZ — University Hospital — 5.

*Wednesday*

CHARLES W. LEFEVER and S. J. GITTELSON — Mt. Sinai Hospital — 3.
E. D. FUNK — Jefferson Hospital — 2.
L. WEBSTER FOX — Medico-Chirurgical Hospital — 1.
S. LEWIS ZIEGLER — Wills Eye Hospital — 2.
SAMUEL D. RISLEY — Wills Eye Hospital — 2.
MCCLUNEY RADCLIFFE — Wills Eye Hospital — 3.
WILLIAM M. SWEET — Wills Eye Hospital — 2.
PAUL PONTIUS — Wills Eye Hospital — 2.
WENDELL REBER — Polyclinic Hospital — 1.
WILLIAM T. SHOEMAKER — German Hospital — 1.
CHARLES J. JONES — St. Joseph's Hospital — 3.
MIRIAM M. BUTT — Woman's Hospital — 2.
MARY BUCHANAN — Woman's College Hospital — 2.
H. G. GOLDBERG — Episcopal Hospital — 2.
LEWIS LOVE — St. Mary's Hospital — 3.
J. C. KNIPE — Jewish Hospital — 2.
JOHN W. CROSKEY — Philadelphia General Hospital — 2.
E. A. SHUMWAY — Philadelphia General Hospital — 3.
T. B. HOLLOWAY, MAXWELL LANGDON, and CARL WILLIAMS — University Hospital — 5.

*Thursday*

PHILIP H. MOORE — Methodist Hospital — 3.
J. A. KEARNEY — St. Agnes Hospital — 3.
J. C. KNIPE — Jefferson Hospital — 3.
E. D. FUNK — Jefferson Hospital — 2.
WILLIAM T. SHOEMAKER — Pennsylvania Hospital — 2.
GEORGE S. CRAMPTON — Pennsylvania Hospital — 2.
WILLIAM CAMPBELL POSEY — Wills Eye Hospital — 2.
P. N. K. SCHWENK — Wills Eye Hospital — 1:30.
WILLIAM ZENTMAYER — Wills Eye Hospital — 2.
L. APPLEMAN — Polyclinic Hospital — 1.
MARY BUCHANAN — Woman's Hospital — 2.
FREDERICK KRAUSS — Episcopal Hospital — 2.
AARON BRAV — Lebanon Hospital — 2.
JAMES THORINGTON and J. M. GRISCOM — Presbyterian Hospital — 2.
G. E. DE SCHWEINITZ and E. A. SHUMWAY — University Hospital — 3.

*Friday*

H. F. HANSELL and WILLIAM M. SWEET — Jefferson Hospital — 2:45.
S. LEWIS ZIEGLER — Wills Eye Hospital — 2.
SAMUEL D. RISLEY — Wills Eye Hospital — 2.
MCCLUNEY RADCLIFFE — Wills Eye Hospital — 2.
PAUL PONTIUS — Wills Eye Hospital — 2.
E. A. SHUMWAY and H. M. LANGDON — Children's Hospital — 2.
WENDELL REBER — Polyclinic Hospital — 1.
L. PETER — Polyclinic Hospital — 5.
WILLIAM T. SHOEMAKER — German Hospital — 1.
CHARLES J. JONES — St. Joseph's Hospital — 3.
G. ORAM RING — Episcopal Hospital — 2.
LEWIS LOVE — St. Mary's Hospital — 3.
MIRIAM BUTT — Woman's Hospital — 2.
E. D. FUNK — Jefferson Hospital — 2.
AARON BRAV — Jewish Hospital — 3.

*Saturday*

E. D. FUNK — Jefferson Hospital — 2.
WILLIAM T. SHOEMAKER — Pennsylvania Hospital — 2.
GEORGE S. CRAMPTON — Pennsylvania Hospital — 2.
P. N. K. SCHWENK — Wills Eye Hospital — 1:30.
WILLIAM ZENTMAYER — Wills Eye Hospital — 2.
H. G. GOLDBERG — Episcopal Hospital — 2.
AARON BRAV — Lebanon Hospital — 2.
WILLIAM CAMPBELL POSEY — Wills Eye Hospital — 2.

## SURGERY OF THE EAR, NOSE AND THROAT

*Monday*

CHARLES G. GRAYSON — University Hospital — 2.
R. SKILLERN — Medico-Chirurgical Hospital — 2.
I. JONES — Blockley Hospital — 2.
MARGARET BUTLER — Woman's Medical College Hospital — 2 to 4.

*Tuesday*

F. R. PACKARD — Pennsylvania Hospital — 2.
D. B. KYLE — Jefferson Hospital — 12.
R. SKILLERN — Medico-Chirurgical Hospital — 2.

*Wednesday*

WALTER ROBERTS — Polyclinic Hospital — 2.
RALPH BUTLER — Polyclinic Hospital — 3.
R. SKILLERN — Medico-Chirurgcal Hospital — 2.
MARGARET BUTLER and LAURA HUNT — Woman's Hospital — 2 to 4.

*Thursday*

GEORGE M. COATES — Polyclinic Hospital — 1.

*Friday*

SETH MACCUEN SMITH — Jefferson Hospital — 1:30.
GEORGE M. COATES — Pennsylvania Hospital — 1.
MARGARET BUTLER and LAURA HUNT — Woman's Hospital — 2 to 4.

*Days to be announced*

ARTHUR WATSON — Polyclinic Hospital.
G. HUDSON MAKUEN — Polyclinic Hospital.
ALEXANDER RANDALL — University Hospital.
E. B. GRAYSON — Medico-Chirurgical Hospital.